lenovo

ThinkServer TS140 Hardware Maintenance Manual

ThinkThinkThinkServerThink

Machine Types: 70A0, 70A1, 70A4, and 70A5

Note: Before using this information and the product it supports, be sure to read and understand the following:

- The *Read Me First* that comes with your product
- “Safety information” on page iii
- Appendix A “Notices” on page 101

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Safety information

Note: Before using the product, be sure to read and understand the multilingual safety instructions on the documentation DVD that comes with the product.

قبل استخدام المنتج، تأكد من قراءة إرشادات الأمان متعددة اللغات وفهمها، وتوجد هذه الإرشادات في قرص DVD الوثائقي الذي يأتي مع المنتج.

Antes de usar o produto, leia e entenda as instruções de segurança multilíngues no DVD de documentação que o acompanha.

Преди да използвате този продукт, задължително прочетете и вникнете в многоезичните инструкции за безопасност в DVD диска с документация, който се предоставя с продукта.

Prije upotrebe ovog proizvoda obavezno pročitajte višejezične sigurnosne upute koje se nalaze na DVD-u s dokumentacijom koji dobivate uz proizvod.

Před použitím produktu je třeba si přečíst a porozumět bezpečnostním pokynům uvedeným na disku DVD s dokumentací, který je dodáván s produktem.

Før du bruger produktet, skal du sørge for at læse og forstå de sikkerhedsforskrifter, der findes på flere sprog, på den dokumentations-dvd, der følger med produktet.

Lue tuotteen mukana toimitetulla DVD-tietolevyllä olevat monikieliset turvaohjeet ennen tämän tuotteen käyttöä.

Avant d'utiliser le produit, veillez à bien lire et comprendre les instructions de sécurité multilingues figurant sur le DVD de documentation fourni avec le produit.

Πριν χρησιμοποιήσετε το προϊόν, βεβαιωθείτε ότι έχετε διαβάσει και κατανοήσει τις οδηγίες ασφάλειας, οι οποίες είναι διαθέσιμες σε διάφορες γλώσσες στο DVD τεκμηρίωσης που συνοδεύει το προϊόν.

Vor Verwendung des Produkts sollten Sie unbedingt die mehrsprachigen Sicherheitsanweisungen auf der Dokumentations-DVD lesen, die im Lieferumfang des Produkts enthalten ist.

לפני השימוש במוצר, הקפידו לקרוא ולהבין את הוראות הבטיחות, המופיעות בשפות שונות ב-DVD התיעוד המצורף למוצר.

A termék használata előtt mindenképpen olvassa el és értelmezze a termékhez kapott dokumentációs DVD lemezen található, több nyelven elolvasható biztonsági előírásokat.

Prima di utilizzare il prodotto, accertarsi di leggere e comprendere le informazioni sulla sicurezza multilingue disponibili sul DVD di documentazione fornito con il prodotto.

製品をご使用になる前に、製品に付属の Documentation DVD に収録されているマルチリンガルの「安全に正しくご使用いただくために」を読んで理解してください。

제품을 사용하기 전에 제품과 함께 제공되는 문서 DVD의 다국어 안전 지침을 주의 깊게 읽어보십시오.

Voordat u het product gebruikt, moet u ervoor zorgen dat u de meertalige veiligheidsinstructies op de documentatie-dvd van het product hebt gelezen en begrijpt.

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Przed skorzystaniem z produktu należy zapoznać się z wielojęzycznymi instrukcjami bezpieczeństwa znajdującymi się na płycie DVD z dokumentacją dostarczoną wraz z produktem.

Antes de utilizar o produto, leia atentamente as instruções de segurança multilingues que constam no DVD de documentação fornecido com o produto.

Înainte de a utiliza produsul, asigurați-vă că ați citit şi înțeles instrucțiunile de siguranță în mai multe limbi de pe DVD-ul cu documentație care însoțeşte produsul.

Før du bruker produktet, må du lese og forstå den flerspråklige sikkerhetsinformasjonen på DVDen med dokumentasjon som følger med produktet.

Прежде чем использовать этот продукт, внимательно ознакомьтесь с инструкциями по технике безопасности на разных языках, которые можно найти на DVD-диске с документацией в комплекте с продуктом.

在使用本产品之前，请务必先阅读和了解产品附带的文档 DVD 中的多语言安全说明。

Pre nego to upotrebite proizvod obavezno paljivo proitajte i prouite viejeziko uputstvo za bezbednost na dokumentacionom DVD-u koji ste dobili uz proizvod.

Pred pouvanm produktu si pretajte viacjazyn bezpenostn pokyny na disku DVD s dokumentciou dodanom s produktom.

Preden začnete uporabljati izdelek, je pomembno, da preberete in razumete večjezična varnostna navodila na DVD-ju z dokumentacijo, ki ste ga prejeli skupaj z izdelkom.

Antes de utilizar el producto, asegúrese de leer y comprender las instrucciones de seguridad multilingües del DVD de documentación que se proporciona con el producto.

Var noga med att läsa säkerhetsinstruktionerna på dokumentations-DVD-skivan som följer med produkten innan du börjar använda produkten.

使用本產品之前，請務必閱讀並瞭解產品隨附的文件 DVD 上的多國語言版本安全資訊。

Bu ürünü kullanmadan önce, ürünle birlikte gönderilen belge DVD'si üzerindeki çok dil içeren güvenlik yönergelerini okuyup anladýðýnýzdan emin olun.

Перед використанням цього продукту уважно ознайомтеся з інструкціями з техніки безпеки на різних мовах, що можна знайти на DVD-диску з документацією в комплекті з продуктом.

Important: For translated versions of the caution or danger statement, refer to the *Safety, Warranty, and Support Information* document.

Ensure that you read and understand all caution and danger statements in this document before you perform the procedures. Read and understand any additional safety information that is included with the server or optional device before you install, remove, or replace the device.

Statement 1

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Ensure that all power cord connectors are securely and completely plugged into receptacles.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To connect:	**To disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlets.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlets.	4. Remove all cables from devices.
5. Turn devices ON.	

Statement 2

DANGER

Danger of explosion if battery is incorrectly replaced.

When replacing the lithium coin cell battery, use only the same or an equivalent type that is recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

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Statement 3

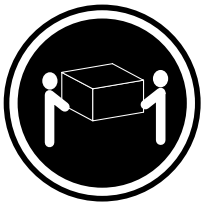
CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

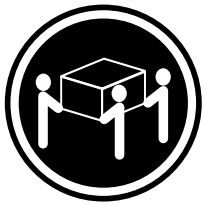
DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following: **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

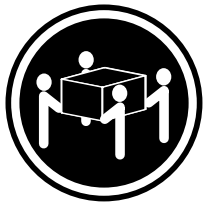
Statement 4



≥ 18 kg (39.7 lb)
< 32 kg (70.5 lb)



≥ 32 kg (70.5 lb)
< 55 kg (121.2 lb)

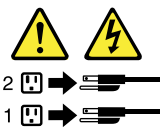


≥ 55 kg (121.2 lb)
< 100 kg (220.5 lb)

CAUTION:
Use safe practices when lifting.

Statement 5

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 6

CAUTION:
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to a power source that is easily accessible in case it needs to be disconnected.

Statement 7

CAUTION:
If the device has doors, ensure that you remove or secure the doors before moving or lifting the device to protect against personal injury. The doors will not support the weight of the device.

Statement 8

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 9

CAUTION:
Disconnect the hot-swap fan cables before removing the fan from the device to protect against personal injury.

Statement 10

CAUTION:
The following label indicates a sharp-edge hazard.

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Statement 11

CAUTION:
The following label indicates a potential heat hazard.

Statement 12

DANGER

Overloading a branch circuit is a potential fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch current ratings at the installation site.

Statement 13

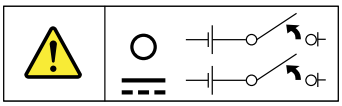
CAUTION:
Ensure that the rack is secured properly to avoid tipping when the server unit is extended on the rails.

Statement 14

CAUTION:
Some accessory or option board outputs exceed Class 2 or limited power source limits. You must install the appropriate interconnecting cabling in accordance with your local electrical code requirements.

Statement 15

CAUTION:
The power-control button on the device may put the device in standby mode instead of turning off the device. In addition, the device might have multiple connections to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.



Statement 16

CAUTION:
To reduce the risk of electric shock or energy hazards:

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by your local electrical code and the latest edition of IEC 60950.**
- **Connect the equipment to a reliably earthed safety extra low voltage (SELV) source. An SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).**
- **The branch circuit overcurrent protection must be rated in accordance with local electrical code requirements.**
- **Use 1.3 mm^2 or 16 American Wire Gauge (AWG) copper conductor only, not exceeding 3 meters in length.**
- **Torque the wiring-terminal screws to 1.4 newton-meters or 12 inch-pounds.**
- **Provide a readily available, approved and rated disconnect device in the field wiring.**

Statement 17

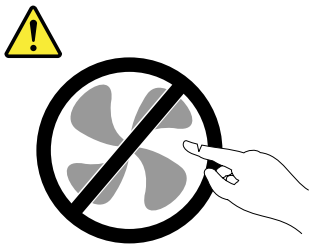
CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments.

Statement 18

CAUTION:
Do not place any object on top of rack-mounted products.

Statement 19

CAUTION:
Hazardous moving parts. Keep fingers and other body parts away.



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Statement 20

CAUTION:
A lithium ion battery is provided. To avoid possible explosion, do not burn the battery. Replace the battery only with the Lenovo-approved part. Recycle or discard the battery as instructed by local regulations.

Products that are not assessed

Typical products that are **not assessed** include but not limited to the following:

- Server and IT-rack components (for example, uninterruptible power supplies and current distribution systems)
- Devices in IT rooms (for example, bulk storage units and network products)
- Industrial low-voltage switchgear

Safety inspection guide

The purpose of this inspection guide is to assist you in identifying potentially unsafe conditions. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury. This guide addresses only those items. You should use good judgment to identify potential safety hazards due to attachment of non-ThinkServer features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock)
- Explosive hazards, such as a damaged Cathode Ray Tube (CRT) monitor or a bulging capacitor
- Mechanical hazards, such as loose or missing hardware

To determine whether there are any potentially unsafe conditions, use the following checklist at the beginning of every service task. Begin the checks with the power off, and the power cords disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power off the server. Disconnect the power cords.
3. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
   b. The power cord should be the type specified in the parts list.
   c. Insulation must not be frayed or worn.
4. Check for cracked or bulging batteries.
5. Remove the cover.
6. Check for any obvious non-ThinkServer alterations. Use good judgment as to the safety of any non-ThinkServer alterations.

7. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
8. Check for worn, frayed, or pinched cables.
9. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Grounding requirements

Electrical grounding of the server is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

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Chapter 1. General information

This chapter provides some general information about your server.

This chapter contains the following topics:

- “Introduction” on page 1
- “Server documentation” on page 2

Introduction

This user guide for your Lenovo® ThinkServer® product contains information about the server features, specifications, component locations, configuration instructions, hardware replacement procedures, and basic troubleshooting and diagnostics.

Your server comes with a documentation DVD that contains various server documents to help you use and maintain the server. Meanwhile, your server comes with a *ThinkServer EasyStartup* DVD that provides a convenient solution for configuring the server and installing an operating system.

The Lenovo Limited Warranty (LLW) contains the warranty terms that apply to the product you purchased from Lenovo. Read the LLW on the documentation DVD that comes with your server. A printable generic version of the latest LLW also is available in more than 30 languages at http://www.lenovo.com/warranty/llw_02. If you cannot obtain the LLW through the documentation DVD or Lenovo Web site, contact your local Lenovo office or reseller to obtain a printed version of the LLW, free of charge.

For warranty service, consult the worldwide Lenovo Support telephone list. Telephone numbers are subject to change without notice. The most up-to-date telephone list for Lenovo Support is always available on the Web site at http://www.lenovo.com/support/phone. If the telephone number for your country or region is not listed, contact your Lenovo reseller or Lenovo marketing representative.

To obtain the most up-to-date information about the server, go to:
http://www.lenovo.com/thinkserver

Lenovo maintains pages on the World Wide Web, where you can get the latest technical information and download documentation or device drivers and updates. To access the Lenovo Support Web site, go to:
http://www.lenovo.com/support

Record information about the server in the following table. You will need these information when you register the server with Lenovo.

For where to find the product information label on the chassis, see “Machine type, model, and serial number label” on page 12.

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Product name	_____
Machine type and model (MT-M)	_____
Serial number (S/N)	_____
Date of purchase	_____

You can register your server with Lenovo by following the instructions at:
http://www.lenovo.com/register

When you register your server, information is entered into a database, which enables Lenovo to contact you in case of a recall or other severe problem. After you register your server with Lenovo, you will receive quicker service when you call Lenovo for help. In addition, some locations offer extended privileges and services to registered users.

Server documentation

This topic provides general descriptions of the various documentation for your server and instructions on how to obtain all the documentation.

Printed document

The following document is printed out and contained in your server package.

Read Me First

This is a multilingual document you should read first. This document guides you to read the complete warranty, support, and safety information on the documentation DVD that comes with your server before using the product. This document also provides information about how to find the most up-to-date information on the Lenovo Support Web site.

Documentation DVD

The documentation DVD, which comes with your server, contains various documents for your server in Portable Document Format (PDF) and HyperText Markup Language (HTML). The documentation DVD is not bootable. To view the documents on the DVD, you will need a computer with a Web browser and the Adobe Reader program, which is available for download at:
http://www.adobe.com

To start the documentation DVD, insert the DVD into the optical drive. The DVD is AutoPlay enabled and starts automatically in most Microsoft® Windows® environments. If the DVD fails to start or if you are using a Linux® operating system, open the launch.htm file located in the root directory of the DVD.

Note: Lenovo maintains pages on the World Wide Web, where you can get the latest technical information and download documentation or device drivers and updates. Some information in the documents on the documentation DVD might change without notice after the first release of the DVD. You can always obtain all the most up-to-date documentation for your server from the Lenovo Web site at:
http://www.lenovo.com/UserManuals

The following documents are on the documentation DVD that comes with your server:

- *Safety, Warranty, and Support Information*

  This is a multilingual document that includes all the safety statements for your product in more than 30 languages. Be sure to read and understand all the safety statements before using the product. This document also includes the Lenovo warranty statement, Customer Replaceable Units (CRUs) information, and information about how to contact the Lenovo Customer Support Center.

- *Lenovo License Agreement*

  This document includes the terms and conditions of the Lenovo License Agreement.

- *User Guide*

  This document provides detailed information to help you get familiar with your server and help you use, configure, and maintain your server.

Document only for trained service personnel

The following document is intended only for trained service personnel of Lenovo.

Hardware Maintenance Manual

This document provides information about component locations, replacement procedures for major Field Replaceable Units (FRUs), and troubleshooting and diagnostics. This document is updated frequently, and the most up-to-date version is always available in English on the Lenovo Web site at: http://www.lenovo.com/UserManuals

Chapter 2. Server setup road map

This chapter provides a general road map to guide you through setting up your server.

The server setup procedure varies depending on the configuration of the server when it was delivered. In some cases, the server is fully configured and you just need to connect the server to the network and an ac power source, and then you can turn on the server. In other cases, the server needs to have hardware features installed, requires hardware and firmware configuration, and requires an operating system to be installed.

The general procedure for setting up your server is:

1. Unpack the server package. See “Server package” on page 7.
2. Install any required hardware or server option. See the related topics in Chapter 6 “Installing, removing, or replacing hardware” on page 37.
3. Connect the Ethernet cable and power cords to the server. See “Rear view of the server” on page 14 to locate the connectors.
4. Turn on the server to verify operation. See “Turning on the server” on page 19.
5. Review the Unified Extensible Firmware Interface (UEFI) settings and customize as needed. See “Starting the Setup Utility program” on page 21.
6. Configure RAID and install the operating system and basic drivers. See “ThinkServer EasyStartup” on page 11 and “Configuring RAID” on page 32.
7. Install any additional drivers needed for added features. Refer to the instructions that come with the hardware option.
8. Configure Ethernet settings in the operating system by referring to the operating system help. This step is not required if the operating system was installed using the ThinkServer EasyStartup program.
9. Check for firmware and driver updates. See “Updating the firmware” on page 34.
10. Install other applications. Refer to the documentation that comes with the applications that you want to install.

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Chapter 3. Product overview

This chapter provides information about the server package, features, specifications, and software programs.

Server package

The server package includes the server, a power cord, printed documentation, a documentation DVD, and software media.

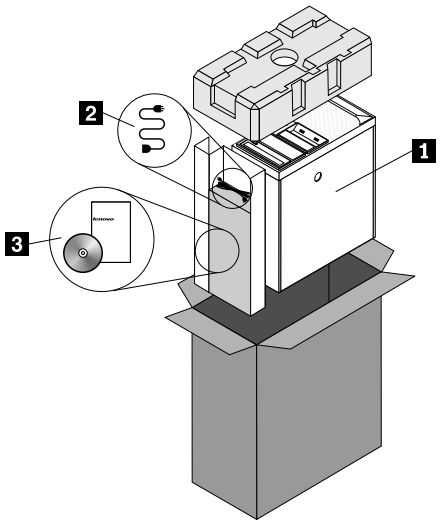

Figure 1. Server package

1 Server

2 Power cord

3 Material box (including printed documentation, a documentation DVD, and software media)

Features

This topic provides general information about the server features for various models. Depending on your specific model, some features might vary or not be available. For information about your specific model, use the Setup Utility program. See “Viewing information in the Setup Utility program” on page 21. You also can refer to the *Personal Systems Reference* document for ThinkServer products at: http://www.lenovo.com/psref/

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Microprocessor

Your server comes with one of the following microprocessors (internal cache size varies by model type):

- Intel® Core™ i3 microprocessor
- Intel Pentium® microprocessor
- Intel Xeon® microprocessor

For a list of the ThinkServer microprocessor options, go to:
http://www.lenovo.com/thinkserver

Memory

Your server has four memory slots. For more information, see “Installing or removing a memory module” on page 43.

Power supply

Your server comes with one of the following power supply configurations:

- 280-watt automatic voltage-sensing power supply
- 450-watt automatic voltage-sensing power supply

Fans

Your server comes with the following fans to provide proper system cooling and airflow:

- One front system fan
- One heat sink and fan assembly
- One rear system fan

Internal drives

Internal drives are devices that your server uses to read and store data. The internal drives supported by your server vary by model.

- Hard disk drive
  - Up to four 3.5-inch Serial Advanced Technology Attachment (SATA) hard disk drives
  - Up to four 2.5-inch SATA hard disk drives or solid-state drives
- Optical drive

  One SATA optical drive in some models
- RDX drive

  Your server supports an internal RDX drive that enables you to store data on RDX media. The internal RDX drive must be installed in the secondary optical drive bay. To install or replace an internal RDX drive, see “Installing or replacing an internal RDX drive” on page 65.

  Note: If your server is installed with a Windows Server operating system, you can use the Windows Backup program to backup the data stored on RDX media. For detailed information, refer to the user guide of the RDX drive. The user guide is available for download at:
  http://www.lenovo.com/UserManuals

For the location information about the internal drives or drive bays, see “Internal drives” on page 17.

Expansion slots

The server has four expansion slots on the system board. For detailed information, see “Locating parts on the system board” on page 16.

Input/Output (I/O) features

- One 9-pin serial port
- One Ethernet connector
- One Video Graphics Array (VGA) monitor connector
- Six USB 3.0 connectors (two on the front panel and four on the rear panel)
- Three audio connectors on the rear panel (audio line-in connector, audio line-out connector, and microphone connector)
- Two DisplayPort connectors
- Two USB 2.0 connectors on the rear panel

For the location information about the connectors, refer to the related topics in “Locations” on page 12.

Video subsystem

Integrated graphics for a VGA connector and two DisplayPort connectors

Ethernet connectivity

One RJ-45 Ethernet connector on the rear panel with 100 Mbps or 1000 Mbps network connectivity.

For more information, see “Rear view of the server” on page 14.

Reliability, availability, and serviceability

Reliability, availability, and serviceability (hereinafter referred to as RAS) are three important server design features. The RAS features help you to ensure the integrity of the data stored on the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

Your server has the following RAS features:

- **Security features**
  - Administrator password and user password to help protect unauthorized access to the server (see “Using passwords” on page 25)
  - ThinkServer Trusted Platform Module (TPM), which is a security chip, to help enhance server security

    Note: The TPM is only available in some models.
  - Remote monitoring or control by an administrator to provide protection or help
- **Basic system management features**
  - Ability to store the power-on self-test (POST) hardware test results
  - BIOS Setup Utility program

    The BIOS Setup Utility program helps you view the server information and configure the server in the pre-operating system environment. See “Using the Setup Utility program” on page 21.
  - Intel Rapid Storage Technology enterprise (RSTe)

    Intel RSTe is a device driver that provides support for SATA or SAS RAID 0, 1, 5, and 10 arrays on specific Intel chipset system boards to enhance hard disk drive performance.

– Preboot Execution Environment (PXE)

  The Intel PXE technology enables you to boot your computers, load an operating system, or deploy executable images from a remote server by using a network interface. The operation can be done independently of local data storage devices (such as hard disk drives) or operating systems.

– Software programs

  For more information about the software programs, see “Software” on page 11.

– Wake on LAN

  When the Wake on LAN feature is enabled on a computer that is connected to a LAN, a network administrator can remotely turn on or wake up the computer from a management console using remote network management software. Besides, many other functions, such as data transfer and software updates, can be performed remotely without remote attendance and can be done after normal working hours and on weekends to save time and increase productivity.

Specifications

This topic lists the physical specifications for your server.

Dimensions

Width: 175 mm (6.89 inches)

Height: 375 mm (14.76 inches)

Depth: 431 mm (16.97 inches)

Weight

The product weight varies depending on different system configurations.

Maximum configuration without package: 13 kg (28.66 lb)

Maximum configuration with package: 15.5 kg (34.17 lb)

Environment

- Air temperature:

  Operating: 10°C to 35°C (50°F to 95°F)

  Storage: -40°C to 70°C (-40°F to 158°F) in original shipping package
- Altitude: 0 to 3048 m (0 to 10 000 ft) in an unpressurized environment
- Humidity:

  Operating: 8% to 80% (non-condensing)

  Storage without package: 8% to 80% (non-condensing)

  Storage with package: 8% to 90% (non-condensing)

Electrical input

Universal input:

- Low range:

  Minimum: 100 V ac

  Maximum: 127 V ac

  Input frequency range: 50 to 60 Hz
- High range:

  Minimum: 200 V ac

  Maximum: 240 V ac

  Input frequency range: 50 to 60 Hz

Software

This topic provides information about the software programs that you can use to set up, use, and maintain the server.

ThinkServer EasyStartup

The ThinkServer EasyStartup program simplifies the process of configuring RAID and installing supported operating systems and device drivers on your server. This program is provided with your server on a self-starting (bootable) *ThinkServer EasyStartup* DVD. The user guide for the program also is on the DVD and can be accessed directly from the program interface. For detailed information, see “Using the ThinkServer EasyStartup program” on page 29.

ThinkServer EasyUpdate Firmware Updater

The ThinkServer EasyUpdate Firmware Updater program (hereinafter referred to as the Firmware Updater program) enables you to maintain your server firmware up-to-date and helps you avoid unnecessary server outages. The Firmware Updater program is available for downloading from the Lenovo Support Web site. For more information about downloading and using the Firmware Updater program, see “Updating the firmware” on page 34.

BIOS update utilities

The BIOS firmware keeps updating after the shipment of the server. Lenovo maintains pages on the Support Web site and provides the BIOS update utilities with instructions for download to help you update the BIOS firmware if needed. For more information, see “Updating the firmware” on page 34 and “Updating or recovering the BIOS” on page 27.

RAID configuration utilities

Your server supports onboard SATA software Redundant Array of Independent Disks (RAID). For detailed information, see “Configuring RAID” on page 32.

Diagnostic programs

The following diagnostic programs are available for you to diagnose server problems:

- ThinkServer Diagnostic Tool
- ThinkServer System Profile Collection Tool

For more information, see “Using a diagnostic program” on page 91.

Locations

This topic provides information to help you locate your server components.

Machine type, model, and serial number label

This topic helps you locate the label that contains the machine type, model, and serial number information for your server.

When you contact Lenovo for help, the machine type, model, and serial number information helps support technicians to identify your server and provide faster service.

The following is a sample of the machine type, model, and serial number label.

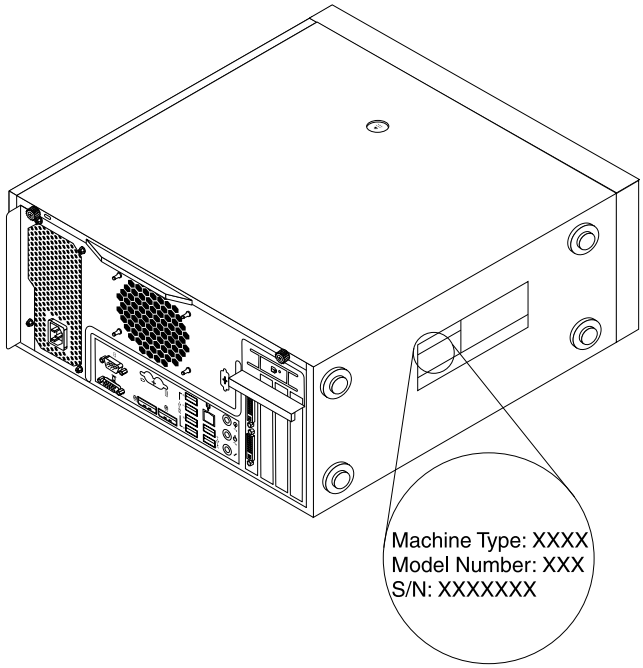


Figure 2. Machine type, model, and serial number label

Front view of the server

This topic provides information to help you locate the parts on the front of the server.

The following illustration shows the front view of the server.

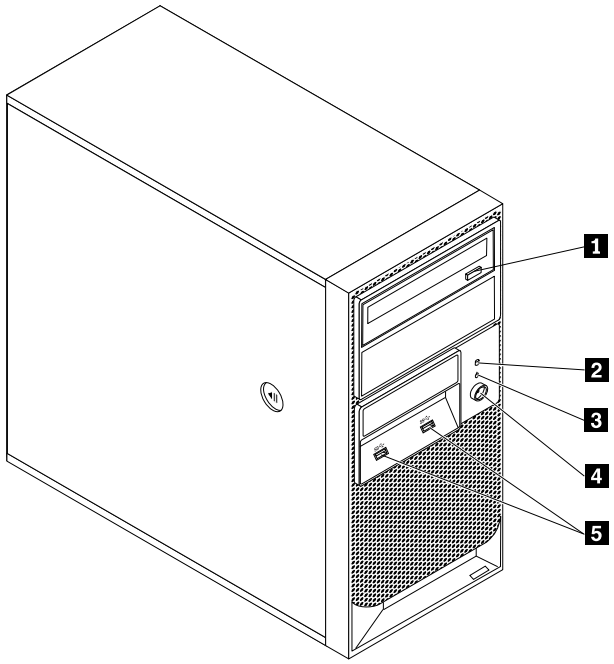


Figure 3. Front view of the server

1 Optical drive eject/close button
2 Hard disk drive activity LED
3 Power-on LED
4 Power button
5 USB 3.0 connectors (2)

Rear view of the server

This topic provides information to help you locate the connectors and components on the rear of your server.

Figure 4 “Rear connector locations” on page 15 shows the locations of the connectors on the rear of your server. Some connectors on the rear of your server are color-coded to help you determine where to connect the cables on your server.

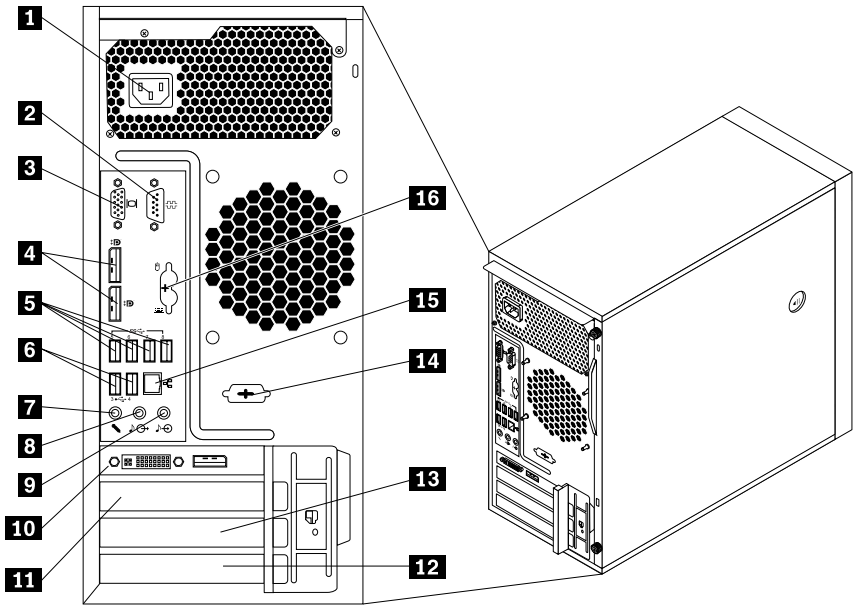


Figure 4. Rear connector locations

1 Power cord connector
2 Serial connector
3 VGA monitor connector
4 DisplayPort connectors (2)
5 USB 3.0 connectors (4)
6 USB 2.0 connectors (2)
7 Microphone connector
8 Audio line-out connector
9 Audio line-in connector
10 PCI Express x16 graphics card (available in some models)
11 PCI Express x1 card slot bracket
12 PCI card slot bracket
13 PCI Express x4 card slot bracket
14 Optional serial connector
15 Ethernet connector
16 PS/2 keyboard and mouse connectors (optional)

Connector	Description
Audio line-in connector	Used to receive audio signals from an external audio device, such as a stereo system. When you attach an external audio device, a cable connects the audio line-out connector of the device to the audio line-in connector of the server.
Audio line-out connector	Used to send audio signals from the server to external devices, such as powered stereo speakers (speakers with built-in amplifiers), headphones, multimedia keyboards, or the audio line-in connector on a stereo system or other external recording device.
DisplayPort connector	Used to attach a high-performance monitor, a direct-drive monitor, or other devices that use a DisplayPort connector.
Ethernet connector	Used to attach an Ethernet cable for a local area network (LAN). **Note:** To operate the server within FCC Class B limits, use a Category 5 Ethernet cable.
Microphone connector	Used to attach a microphone to your server when you want to record sound or if you use speech-recognition software.
Serial connector	Used to attach an external modem, a serial printer, or other devices that use a 9-pin serial connector.

Connector	Description
USB connector	Used to attach a device that requires a USB connector, such as a USB keyboard, a USB mouse, a USB scanner, or a USB printer. If you have more than eight USB devices, you can purchase a USB hub, which you can use to connect additional USB devices.
VGA monitor connector	Used to attach a VGA monitor or other devices that use a VGA monitor connector.

Locating parts on the system board

Figure 5 “System board part locations” on page 16 shows the locations of the parts on the system board.

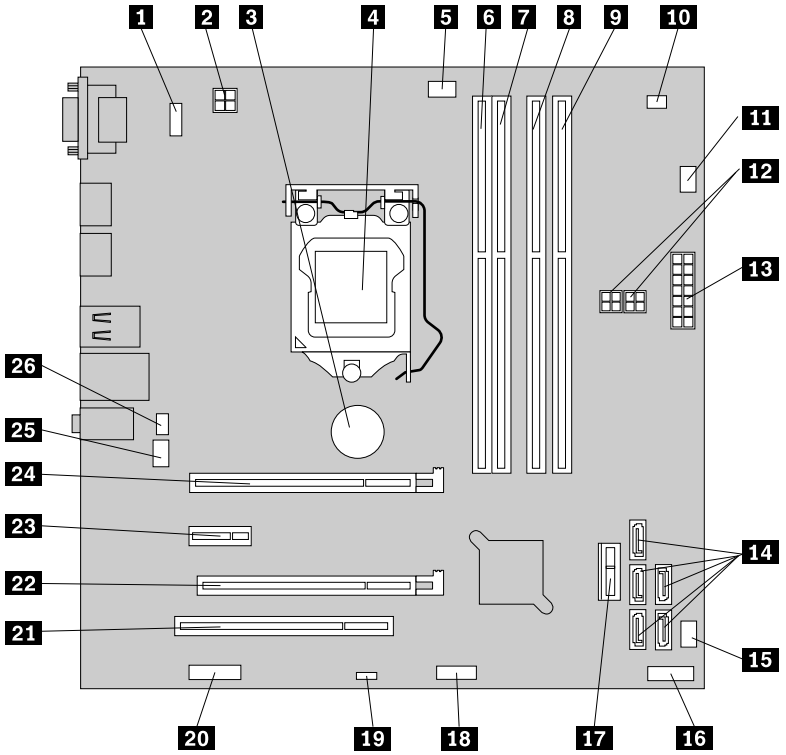


Figure 5. System board part locations

1 PS/2 keyboard and mouse connector

2 4-pin power connector

3 System board battery

4 Microprocessor

5 Microprocessor fan connector

6 Memory slot 1 (DIMM1)

7 Memory slot 2 (DIMM2)

8 Memory slot 3 (DIMM3)

14 SATA 3.0 connectors 0 to 4

15 Power fan connector

16 Front panel connector (for connecting the LEDs and power button on the front of the server)

17 Front USB 3.0 connector (for connecting the USB connectors on the front of the server)

18 Front USB 2.0 connector (for connecting an additional USB device)

19 Clear CMOS (Complementary Metal Oxide Semiconductor) /Recovery jumper

20 Serial (COM2) connector

21 PCI card slot

9 Memory slot 4 (DIMM4)

10 Thermal sensor connector

11 Hard disk drive fan connector

12 4-pin SATA power connectors (2)

13 14-pin power connector

22 PCI Express x4 card slot

23 PCI Express x1 card slot

24 PCI Express x16 card slot

25 System fan connector

26 Cover presence switch connector (intrusion switch connector)

Internal components

Figure 6 “Component locations” on page 17 shows the locations of the various components in your server. To remove the server cover and access the inside of the server, see “Removing the server cover” on page 39.

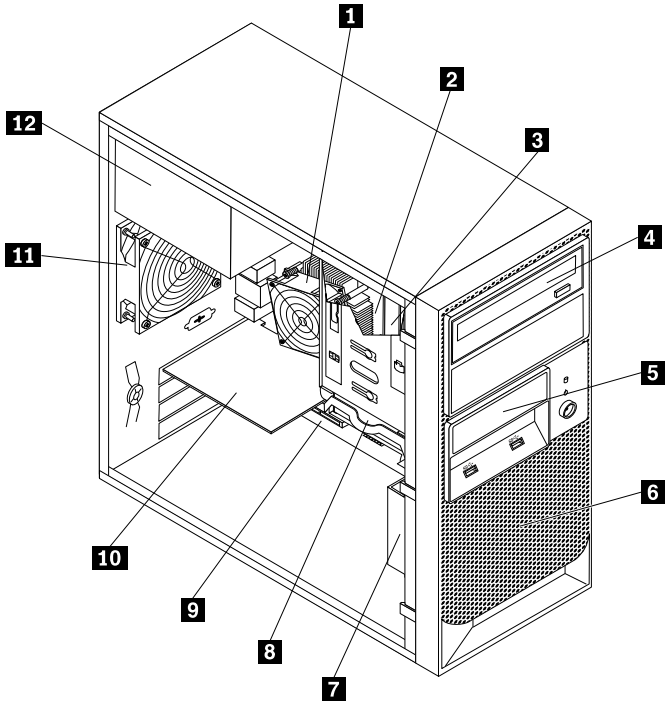


Figure 6. Component locations

1 Heat sink and fan assembly

2 Microprocessor

3 Memory module

4 Optical drive

5 Card reader drive bay

6 Front bezel

7 Front fan assembly

8 Hard disk drive

9 System board

10 Graphics card (available in some models)

11 Rear fan assembly

12 Power supply assembly

Internal drives

Internal drives are devices that your server uses to read and store data. You can add drives to your server to increase storage capacity and enable your server to read other types of media. Internal drives are installed in bays.

Figure 7 “Drive bay locations” on page 18 shows the locations of the drive bays.

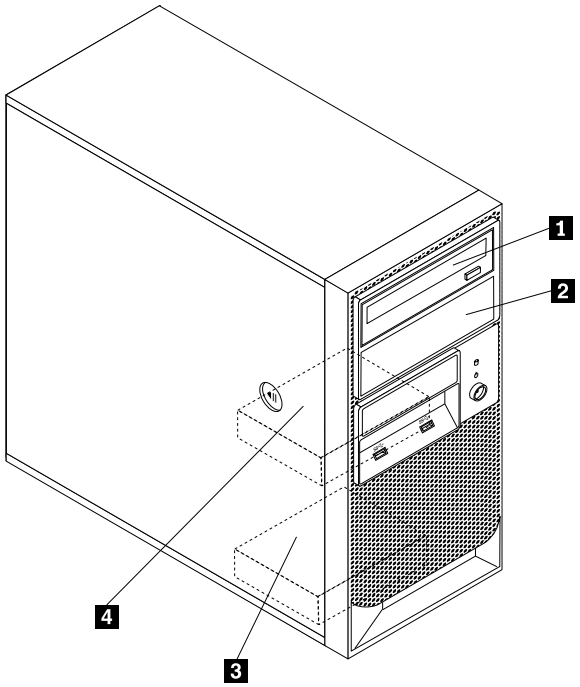


Figure 7. Drive bay locations

1 Primary optical drive bay (also can be used to install the fourth hard disk drive)

2 Secondary optical drive bay (also can be used to install a tertiary hard disk drive)

3 Secondary hard disk drive bay

4 Primary hard disk drive bay

Chapter 4. Turning on and turning off the server

This chapter provides information about turning on and turning off the server.

Turning on the server

After the server is connected to an ac power source, you can turn on the server by pressing the power button.

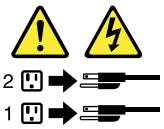
Turning off the server

To remove all power from the server, you must disconnect the power cord from the server.

Some operating systems require an orderly shutdown before you turn off the server. See your operating system documentation for information about shutting down the operating system.

Statement 5

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.
- You can press the power button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power button for more than four seconds to turn off the server.

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Chapter 5. Configuring the server

This chapter provides the following information to help you configure the server:

- “Using the Setup Utility program” on page 21
- “Using the ThinkServer EasyStartup program” on page 29
- “Configuring RAID” on page 32
- “Using the Firmware Updater program” on page 35

Using the Setup Utility program

This topic provides information about using the Setup Utility program.

The Setup Utility program is part of the server firmware. You can use the Setup Utility program to view and change the configuration settings of your server, regardless of which operating system you are using. However, the operating system settings might override any similar settings in the Setup Utility program.

Starting the Setup Utility program

This topic provides instructions on how to start the Setup Utility program.

To start the Setup Utility program, do the following:

1. Connect the server to an ac power source and press the power switch on the front panel to turn on the server. See “Turning on the server” on page 19.
2. Press the F1 key as soon as you see the logo screen. Then, wait for several seconds, and the Setup Utility program opens. If you have set a password, you need to type the correct password to enter the Setup Utility program. For password information, see “Using passwords” on page 25.

Viewing information in the Setup Utility program

The Setup Utility program menu lists various items about the system configuration. Select a desired item to view information or change settings.

When working with the Setup Utility program, you must use the keyboard. The keys used to perform various tasks are displayed on the right bottom pane of each screen. You also can press the F1 key for general help about the keys. For most items, the corresponding help message is displayed on the right top pane of the screen when the item is selected. If the item has submenus, you can display the submenus by pressing Enter.

You can view the following information about your specific server model in the Setup Utility program:

- The **Main** menu lists information about system summary, the BIOS version, machine type and model, and system date and time.

  On the **System Summary** menu, select **Installed Memory** and follow the instructions on the screen to view information about the installed memory modules.
- On the **Advanced** menu, select **CPU Setup** and follow the instructions on the screen to view information about the installed microprocessor and its supported technologies.
- On the **Devices** menu, select **ATA Drive Setup** and follow the instructions on the screen to view information about the installed SATA or SAS devices, such as a hard disk drive or an optical drive.

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Setup Utility program interface

This topic provides general information about the menus and items in the Setup Utility program.

Depending on the BIOS version of your server, some menu or item information might differ slightly from the information in this topic.

Notes:

- The default settings already are optimized for you. Use the default value for any item you are not familiar with. Do not change the value of unfamiliar items to avoid unexpected problems. If you consider changing the server configuration, proceed with extreme caution. Setting the configuration incorrectly might cause unexpected results. If you cannot turn on the server because of incorrect BIOS settings, use the Clear CMOS jumper to restore the BIOS settings to the factory default settings. See “Locating parts on the system board” on page 16.
- If you have changed any hardware in the server, you might need to reflash the BIOS.

The Setup Utility program main interface consists of the following menus:

- “Main menu” on page 22
- “Devices menu” on page 22
- “Advanced menu” on page 23
- “Power menu” on page 24
- “Security menu” on page 23
- “Startup menu” on page 24
- “Exit menu” on page 25

Lenovo provides the BIOS update utility on the Lenovo Support Web site. You can download the BIOS update utility to update the BIOS if the newer BIOS version specifically solves a problem you have. See “Updating or recovering the BIOS” on page 27.

If the power to your server is interrupted while the BIOS is being updated and your server cannot start correctly, use the BIOS recovery switch to recover from a BIOS update failure. See “Recovering from a BIOS update failure” on page 28.

Main menu

After entering the Setup Utility program, you can see the **Main** menu, which lists basic information about the BIOS, total memory size, and system date and time.

To set the system date and time on the **Main** menu, see “Setting the system date and time” on page 25.

Devices menu

You can view or change various device settings on the **Devices** menu in the Setup Utility program. On each submenu, press Enter to view the information or show selectable options and select a desired option by using the up and down arrow keys. Some items are displayed on the menu only if the server supports the corresponding features.

The **Devices** menu contains the following submenus. For more information, enter the corresponding submenu and refer to the instructions on the screen.

- **Serial Port Setup**: View and set serial port configuration parameters.
- **USB Setup**: View and set USB configuration parameters.
- **ATA Drive Setup**: View and set SATA hard disk drive configuration parameters.

- **Video Setup**: View and set the primary video adapter type.
- **Audio Setup**: Enable or disable the onboard audio controller.
- **Network Setup**: Enable or disable the onboard Ethernet controller and other network features.

Advanced menu

You can view or change various server component settings on the **Advanced** menu in the Setup Utility program. The **Advanced** menu contains various configuration submenus and items. On each submenu, press Enter to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.

The **Advanced** menu contains the following submenus. For more information, enter the corresponding submenu and refer to the instructions on the screen.

- **CPU Setup**: View and set CPU setup configuration parameters.
- **Intel® Manageability**: View and set Intel Manageability configuration parameters.
- **Intel® SIPP Support**: Enable or disable the Intel SIPP Support feature.
- **CPU CRID Support**: Enable or disable the CPU CRID Support feature.
- **Chipset CRID Support**: Enable or disable the Chipset CRID Support feature.

Security menu

You can set passwords and configure other security features on the **Security** menu in the Setup Utility program. For each menu item, press Enter to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

Notes:

- **Enabled** means that the function is configured.
- **Disabled** means that the function is not configured.

The **Security** menu contains the following main items:

- **Administrator Password**: View the status of an administrator password.
- **Power-On Password**: View the status of a user password.
- **Set Administrator Password**: Set an administrator password to protect against unauthorized access to your server. See “Using passwords” on page 25.
- **Set Power-On Password**: Set a user password to protect against unauthorized access to your server. See “Using passwords” on page 25.
- **Chassis Intrusion Detection**: Enable or disable the Chassis Intrusion Detection feature.

The **Security** menu contains the following submenus:

- **TCG Feature Setup**: Configure the TPM function. See “Configuring the TPM function” on page 27.
- **System Event Log**: View and clear the system event log.
- **Secure Boot**: View and set secure boot configuration parameters.

Power menu

The **Power** menu in the Setup Utility program provides an interface to help you view or change the server power options.

The **Power** menu contains the following items:

- **After Power Loss**: View and configure the system performance after ac power is removed and the restored.
- **Enhanced Power Saving Mode**: Enable or disable Enhanced Power Saving Mode.

The **Power** menu contains the following submenus:

- **Intelligent Cooling Engine (ICE)**: Enable the system to enter the lower acoustic level or better thermal level.
- **Automatic Power On**: Enable or disable the Automatic Power On features.

Startup menu

The **Startup** menu in the Setup Utility program provides an interface to help you view or change the server startup options, including the startup sequence and boot priority for various devices. After the server restarts, changes in the startup options take effect.

The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. For example, you can define a startup sequence that checks a disc in the optical drive, then checks the hard disk drive, and then checks a network device. For information about setting the startup sequence or selecting a startup device, see “Selecting a startup device” on page 27.

The **Startup** menu contains various configuration submenus and items. For each submenu and item, press **Enter** to show selectable options and select a desired option by using the up and down arrow keys or type desired values from the keyboard. Some items are displayed on the menu only if the server supports the corresponding features.

The Startup menu contains the following submenus:

- **Primary Boot Sequence**: This sequence is used when the system is powered up normally.
- **Automatic Boot Sequence**: This sequence is used when a communication device wakes up the system.
- **Error Boot Sequence**: This sequence is used when an error occurs.

The Startup menu contains the following items:

- **CSM**: If you select **Enabled**, you can install a non-UEFI operating system. If you select **Disabled**, you can install a UEFI operating system.
- **Boot Mode**: Choose the boot policy.
- **Boot Priority**: Set the boot priority of operating systems.
- **Option Keys Display**: If you select **Enabled**, the option keys will be displayed on the logo screen. If you select **Disabled**, the option keys will not be displayed on the logo screen.
- **Option Keys Display Style**: This item controls the option keys display style when you select **Enabled** for the **Option Keys Display** item.
  - If you select **Legacy**, the message “Press F1 to enter Setup, F12 to display Boot Menu” will be displayed on the logo screen.
  - If you select **Normal**, the message “To interrupt normal startup, press Enter” will be displayed on the logo screen.

Exit menu

After you finish viewing or changing settings in the Setup Utility program, you can choose a desired action from the **Exit** menu to save changes, discard changes, or load default values, and exit the program. Press Enter to select the item on the **Exit** menu and then select **Yes** when prompted to confirm the action. For information about exiting the Setup Utility program, see “Exiting from the Setup Utility program” on page 27.

The **Exit** menu contains the following items:

- **Save Changes and Exit**: Save changes and exit the Setup Utility program.
- **Discard Changes and Exit**: Discard changes, load previous values, and then exit the Setup Utility program.
- **Load Optimal Defaults**: Restore the user default values for all the items.
- **OS Optimized Defaults**: Select Enabled to meet the Microsoft Windows 8 certification requirement. The settings for the CSM support, boot mode, boot priority, secure boot, and security RollBack prevention will be affected.

Setting the system date and time

This topic provides instructions on how to set the system date and time in the Setup Utility program.

To set the system date and time in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 21.
2. On the **Main** menu, select **System Time & Date**.
3. Use the Tab key to switch between data elements and type the numbers from the keyboard to set the system date and time.
4. Press F10 to save settings and exit the Setup Utility program.

Using passwords

By using the Setup Utility program, you can set a password to prevent unauthorized access to your server. The following types of passwords are available:

- Power-On Password
- Administrator Password

You do not have to set a password to use your server. However, using a password improves computing security. If you decide to set a password, read the following topics.

Password considerations

A password can be any combination of up to 64 alphabetic and numeric characters. For security reasons, it is recommended to use a strong password that cannot be easily compromised. To set a strong password, use the following guidelines:

- Have at least eight characters in length
- Contain at least one alphabetic character and one numeric character
- Setup Utility program and hard disk drive passwords are not case sensitive
- Not be your name or your user name
- Not be a common word or a common name
- Be significantly different from your previous passwords

Power-On Password

When a Power-On Password is set, you are prompted to type a valid password each time the server is turned on. The server cannot be used until the valid password is typed in.

Administrator Password

Setting an administrator password deters unauthorized users from changing configuration settings. If you are responsible for maintaining the configuration settings of several servers, you might want to set an administrator password. When an administrator password is set, you are prompted to type a valid password each time you try to access the Setup Utility program. The Setup Utility program cannot be accessed until a valid password is typed in.

If both the Power-On Password and Administrator Password are set, you can type either password to use the server. However, you must use your administrator password to change any configuration settings.

Setting, changing, and deleting a password

This topic provides instructions on how to set, change, or delete a password in the Setup Utility program.

To set, change, or delete a password in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 21.
2. From the Setup Utility program main menu, select **Security**.
3. Depending on the password type, select **Set Power-On Password** or **Set Administrator Password**.
4. Follow the instructions on the right side of the screen to set, change, or delete a password.

   Note: A password can be any combination of up to 64 alphabetic and numeric characters. For more information, see “Password considerations” on page 25.

Erasing lost or forgotten passwords (clearing CMOS)

This topic provides instructions on how to erase lost or forgotten passwords, such as a user password.

To erase a lost or forgotten password, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 16.
4. Remove all parts and disconnect all cables that might prevent your access to the Clear CMOS /Recovery jumper.
5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reinstall all parts and reconnect all cables that have been removed.
7. Reinstall the server cover and reconnect the server power cord. See “Completing the parts replacement” on page 88.
8. Turn on the server and leave it on for approximately 10 seconds. Then, turn off the server by holding the power switch for approximately five seconds.
9. Repeat step 1 through step 4.
10. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
11. Reinstall all parts and reconnect all cables that have been removed.
12. Reinstall the server cover and connect the power cords. See “Completing the parts replacement” on page 88.

Configuring the TPM function

The TPM works as a hardware security solution to help you to encrypt data and protect the server.

To enable the TPM function in the Setup Utility program, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 21.
2. On the **Security** menu, select **TCG Feature Setup**, and then press Enter.
3. Select **TCG Security Features**. Then, set the **TPM Support** to **Active**.
4. Press F10 to save settings and exit the Setup Utility program. The server will restart in order to enable the TPM function.

Selecting a startup device

If your server does not start up from a desired device such as the disc or hard disk drive as expected, do one of the following to select the startup device you want.

Note: Not all discs, hard disk drives, or other removable devices are bootable.

- To select a temporary startup device, do the following:

  Note: Selecting a startup device using the following method does not permanently change the startup sequence.

  1. Turn on or restart your server.
  2. When you see the logo screen, press F12 to display the boot menu. The boot device selection window opens.
  3. In the boot device selection window, use the up and down arrow keys on the keyboard to switch between the selections. Press Enter to select the device of your choice. Then, the server will start up from the selected device.
- To view or permanently change the configured startup device sequence, do the following:
  1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 21.
  2. On the **Startup** menu, select the devices for the Primary Startup Sequence, the Automatic Startup Sequence, and the Error Startup Sequence. Read the information displayed on the right side of the screen.
  3. Press F10 to save settings and exit the Setup Utility program. The server will follow the startup device sequence you have set each time you turn on the server.

Exiting from the Setup Utility program

After you finish viewing or changing settings, press Esc to return to the Setup Utility program main menu. If you are on a nested submenu, press Esc repeatedly until you reach the main interface. Then, you can do one of the following to exit the Setup Utility program:

- If you want to save the new settings and exit the Setup Utility program, press F10 or select **Exit → Save Changes and Exit**. Otherwise, your changes will not be saved.
- If you do not want to save the new settings, select **Exit → Discard Changes and Exit**.
- If you want to return to the default settings, press F9 or select **Exit → Load Optimal Defaults**.

Updating or recovering the BIOS

This topic provides instructions on how to update the BIOS and how to recover from a POST and BIOS update failure.

System programs are the basic layer of software built into your server. System programs include the POST, the UEFI BIOS, and the Setup Utility program. The POST is a set of tests and procedures that are performed each time you turn on your server. The UEFI BIOS is a layer of software that translates instructions from other layers of software into electrical signals that the server hardware can execute. You can use the Setup Utility program to view or change the configuration settings of your server. See “Using the Setup Utility program” on page 21.

Lenovo might make changes and enhancements to the BIOS. When updates are released, they are available for download on the Lenovo Web site at http://www.lenovo.com/drivers.

You also can use the Firmware Updater program to help you keep the server firmware up-to-date. See “ThinkServer EasyUpdate Firmware Updater” on page 12.

Updating (flashing) the BIOS

This topic provides instructions on how to update (flash) the BIOS.

Notes:

- Update the BIOS on your server only if the newer BIOS version specifically solves a problem you have. We do not recommend BIOS updates for servers that do not need them. You can view the updated information for the new BIOS version in the installation instructions for the BIOS update package.
- Downgrading the BIOS to an earlier version is not recommended and might not be supported. An earlier BIOS version might not support the latest system configurations.
- If the power to your server is interrupted while the POST and BIOS are being updated, your server might not restart correctly. Ensure that you perform the BIOS update procedure in an environment with a steady power supply. Besides, ensure that your server can restart successfully without encountering hardware problems.
- If you have updated the BIOS firmware, all the BIOS settings become the default settings of the updated BIOS version. You need to check and reconfigure the BIOS settings for your specific needs. You also can record your specific BIOS settings before updating the BIOS for an easier reconfiguration in the new BIOS version.

To update (flash) the BIOS, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the BIOS update package.
2. Download the BIOS update package and the installation instructions in a TXT file.
3. Print the TXT file that contains the installation instructions and follow the instructions to update (flash) the BIOS.
4. Check and reconfigure the BIOS settings for your specific needs based on your note or refer to “Using the Setup Utility program” on page 21.

Recovering from a BIOS update failure

If the power to your server is interrupted while the POST and BIOS is being updated, your server might not restart correctly. If this happens, perform the following procedure to recover from the POST and BIOS update failure. This procedure is commonly called Boot-block Recovery.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Locate the Clear CMOS /Recovery jumper on the system board. See “Locating parts on the system board” on page 16.
4. Remove any cables that impede access to the Clear CMOS /Recovery jumper.

5. Move the jumper from the standard position (pin 1 and pin 2) to the maintenance position (pin 2 and pin 3).
6. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
7. Reinstall the server cover and reconnect the power cords for the server and monitor to electrical outlets. See “Completing the parts replacement” on page 88.
8. Turn on the server and then insert the POST and BIOS update (flash update) disc into the optical drive. The recovery session begins. The recovery session will take two to three minutes. During this time, you will hear a series of beeps.
9. After the recovery session is completed, the series of beeps will end, and the system will automatically turn off. Remove the disc from the optical drive before the system completely turns off.
10. Repeat step 1 through step 4.
11. Move the Clear CMOS /Recovery jumper back to the standard position (pin 1 and pin 2).
12. Reconnect any cables that were disconnected and reinstall the PCI card if removed.
13. Reinstall the server cover and reconnect any cables that were disconnected.
14. Turn on the server to restart the operating system.

Using the ThinkServer EasyStartup program

This topic provides instructions on how to use the ThinkServer EasyStartup program to set up and configure your server.

The ThinkServer EasyStartup program simplifies the process of installing supported operating systems and device drivers on your server. The program works in conjunction with your Windows or Linux operating system installation disc to automate the process of installing the operating system and associated device drivers. This program is provided with your server on a self-starting (bootable) *ThinkServer EasyStartup* DVD. The user guide for the program also is on the DVD and can be accessed directly from the program interface.

If you do not have a *ThinkServer EasyStartup* DVD, you can download an ISO image from the Lenovo Support Web site and make a disc by yourself.

To download the ThinkServer EasyStartup program image and burn it into a disc, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the ThinkServer EasyStartup program.
2. Download the ISO image for the ThinkServer EasyStartup program and the readme file. The readme file contains important information about the ThinkServer EasyStartup program.
3. Print the readme file and read it carefully.
4. Use an optical drive and any DVD burning software to create a bootable disc with the ISO image.

Features of the ThinkServer EasyStartup program

This topic lists the features of the ThinkServer EasyStartup program.

The ThinkServer EasyStartup program has the following features:

- Contained in a self-starting (bootable) DVD
- Easy-to-use, language-selectable interface
- Integrated help system and user guide
- Automatic hardware detection
- Support for multiple operating systems

- Ability to install the operating system and device drivers in an unattended mode to save time
- Provides device drivers based on the server model and detected devices
- Downloads device drivers from the *ThinkServer EasyStartup* DVD according to the operating system
- Selectable partition size and file system type
- Ability to create a reuseable response file that can be used with similarly configured Lenovo servers to make future installations faster

Starting the ThinkServer EasyStartup program

This topic provides instructions on how to start the ThinkServer EasyStartup program. After you start the program and enter the main interface, click **User Guide** for detailed information about how to use this program to help you configure the server and install an operating system.

To start the ThinkServer EasyStartup program, do the following:

1. Insert the *ThinkServer EasyStartup* DVD into an optical drive, set the optical drive as the first startup device, and start your server from the DVD in the optical drive. See “Selecting a startup device” on page 27.
2. Wait for the program to load. Then, you will be prompted for the following selections:
   - The language in which you want to view the program
   - The language of the keyboard layout you will be using with the program

   Note: The supported languages and keyboard layouts for the ThinkServer EasyStartup program are Dutch, English, French, German, Italian, Japanese, Russian, Spanish, and Turkish. Your *ThinkServer EasyStartup* DVD might be English only. In this case, the keyboard layout should be English.
3. After selecting the language and keyboard layout, click **OK**. Then, you will see one or more messages about configuring storage devices. Click **Next** until you are presented with the Lenovo License Agreement. Read the Lenovo License Agreement carefully. In order to continue, you must accept the terms by clicking **Agree**. Then, the Date and time window opens.
4. Set the current date and time and click **OK**. The Start option window opens.
5. The Start option window provides the following selections:
   - Continue to the main interface.
   - Install the operating system using a preexisting response file.

   Read the explanations on the screen and select a desired option. Then, follow the instructions on the screen. If this is the first time you are using the ThinkServer EasyStartup program, select the option to continue to the main interface and view the compatibility notes and user guide.

Notes:

- Functionality and supported operating systems vary depending on the version of the ThinkServer EasyStartup program. From the main interface of the program, click **Compatibility notes** to view the information about the operating systems and server configurations supported by the specific version of the program; and click **User Guide** to view the various functions and learn how to use the program.
- Before using the ThinkServer EasyStartup program to install an operating system, ensure that any external storage devices and fiber channels are configured correctly.

The ThinkServer EasyStartup program main interface provides the following menus on the left pane of the screen:

- **Home**

This menu is the welcome page that contains some general descriptions about the program and the Lenovo copyright and trademark statements.

- **Compatibility notes**

  This menu provides information about the operating systems and server configurations supported by the version of the program you are using.

- **User Guide**

  This menu provides information about the features of the program and instructions on how to use the program.

- **Hardware list**

  This menu displays a list of hardware devices detected by the program.

- **Install operating system**

  This menu displays a series of choices and prompts to collect information required for operating system installation, prepares the hard disk drive for installation, and then initiates the installation process using your operating system installation disc.

- **Download drivers**

  This menu helps you download the required device drivers from the *ThinkServer EasyStartup* DVD to a removable storage device so that you can easily get the drivers for server configuration when you need them.

  Note: The most up-to-date device drivers for various server models are always available for download on the Lenovo Support Web site at:
  http://www.lenovo.com/drivers

- **About**

  This menu provides the version information and legal notices.

Using the ThinkServer EasyStartup program on a Windows operating system

You can run the *ThinkServer EasyStartup* DVD on a Windows operating system with the Internet Explorer® 6.0 Web browser or a later version installed. Enter the operating system and insert the *ThinkServer EasyStartup* DVD into an internal or external optical drive. The DVD starts automatically in most environments. If the DVD does not start automatically, open the launch.exe file located in the root directory of the DVD.

Note: You should read and accept the Lenovo License Agreement when prompted.

You can do the following when using the ThinkServer EasyStartup program on a Windows operating system.

- View a general introduction to your ThinkServer server model and the specific server configuration information.
- View general guidance on how to use the *ThinkServer EasyStartup* DVD.
- Download the required device drivers to a removable storage device so that you can easily get the drivers for server configuration when you need them, especially when you finish installing an operating system without using the *ThinkServer EasyStartup* DVD and need appropriate device drivers to configure your server.
- Install the required device drivers directly on the server on which you are running the *ThinkServer EasyStartup* DVD.
- View information about all server models supported by the ThinkServer EasyStartup program and information about the device drivers for each server model, including the driver versions and driver locations in the root directory of the *ThinkServer EasyStartup* DVD.

Note: The most up-to-date device drivers for various server models are always available for download on the Lenovo Support Web site at:
http://www.lenovo.com/drivers

For detailed information, refer to the help information system for the ThinkServer EasyStartup program.

Configuring RAID

This topic provides information about how to configure Redundant Array of Independent Disks (RAID) for your server.

Note: The information about configuring RAID in this topic is applicable only in a Windows environment. For information about configuring RAID in a Linux environment, contact your Linux software provider.

About RAID

RAID, an acronym for Redundant Array of Independent Disks, is a technology that provides increased storage functions and reliability through redundancy. This is achieved by combining multiple hard disk drives into a logical unit, where data is distributed across the drives in one of several ways called RAID levels.

When a group of independent physical hard disk drives are set up to use RAID technology, they are in a RAID array. This array distributes data across multiple hard disk drives, but the array appears to the host server as one single storage unit. Creating and using RAID arrays provides high performance, such as the expedited I/O performance, because several drives can be accessed simultaneously.

RAID drive groups also improve data storage reliability and fault tolerance compared to single-drive storage systems. Data loss resulting from a drive failure can be prevented by reconstructing missing data from the remaining drives.

The following list describes some of the most commonly used RAID levels:

- **RAID 0**: block-level striping without parity or mirroring

  Simple stripe sets are normally referred to as RAID 0. RAID 0 uses striping to provide high data throughput, especially for large files in an environment that does not require fault tolerance. RAID 0 has no redundancy and it provides improved performance and additional storage without fault tolerance. Any drive failure destroys the array and the likelihood of failure increases with more drives in the array. RAID 0 does not implement error checking, so any error is uncorrectable. More drives in the array means higher bandwidth, but greater risk of data loss.

  RAID 0 requires a minimum number of two hard disk drives.

- **RAID 1**: mirroring without parity or striping

  RAID 1 uses mirroring so that data written to one drive is simultaneously written to another drive. This is good for small databases or other applications that require small capacity but complete data redundancy. RAID 1 provides fault tolerance from disk errors or failures and continues to operate as long as at least one drive in the mirrored set is functioning. With appropriate operating system support, there can be increased read performance and only a minimal write performance reduction.

  RAID 1 requires a minimum number of two hard disk drives.

- **RAID 5**: block-level striping with distributed parity

  RAID 5 uses disk striping and parity data across all drives (distributed parity) to provide high data throughput, especially for small random access. RAID 5 distributes parity along with the data and requires all drives but one to be present to operate; drive failure requires replacement, but the array is not destroyed by a single drive failure. Upon drive failure, any subsequent read operations can be calculated from the distributed parity so that the drive failure is masked from the end user. The array will have data loss in the event of a second drive failure and is vulnerable until the data that was on the failing drive is rebuilt onto a replacement drive. A single drive failure in the set will result in reduced performance of the entire set until the failing drive has been replaced and rebuilt.

  RAID 5 requires a minimum number of three hard disk drives.

- **RAID 10**: a combination of RAID 0 and RAID 1

  RAID 10 consists of striped data across mirrored spans. A RAID 10 drive group is a spanned drive group that creates a striped set from a series of mirrored drives. RAID 10 allows a maximum of eight spans. You must use an even number of drives in each RAID virtual drive in the span. The RAID 1 virtual drives must have the same stripe size. RAID 10 provides high data throughput and complete data redundancy but uses a larger number of spans.

  RAID 10 requires a minimum number of four hard disk drives and also requires an even number of drives, for example, six hard disk drives or eight hard disk drives.

Configuring the system BIOS to enable onboard SATA RAID functionality

This describes how to configure the system BIOS to enable onboard SATA RAID functionality.

Note: Use the arrow keys on the keyboard to make selections.

To enable SATA RAID functionality, do the following:

1. Start the Setup Utility program. See “Starting the Setup Utility program” on page 21.
2. Select **Devices → ATA Drive Setup**.
3. Select **Configure SATA as** and press Enter.
4. Select **RAID Mode** and press Enter.
5. Press F10 to save changes and exit the Setup Utility program.

Creating RAID volumes

This describes how to use the Intel Rapid Storage Technology enterprise option ROM configuration utility to create RAID volumes.

To create RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel Rapid Storage Technology enterprise option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Create RAID Volume** and press Enter.
3. Type a proper RAID volume name in the **Name** field and press Tab.
4. Use the arrow keys to select a RAID level in the **RAID Level** field and press Tab.
5. If appropriate, use the arrow keys to select a stripe size in the **Stripe Size** field and press Tab.
6. Type a volume size in the **Capacity** field and press Tab.
7. Press Enter to initiate volume creation.
8. When prompted, press Y to accept the warning message and create the volume.
9. If desired, return to step 2 to create additional RAID volumes.
10. When finished, select **Exit** and press Enter.

Deleting RAID volumes

This describes how to use the Intel Rapid Storage Technology enterprise option ROM configuration utility to delete RAID volumes.

To delete RAID volumes, do the following:

1. Press Ctrl+I when prompted to enter the Intel Rapid Storage Technology enterprise option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Delete RAID Volume** and press Enter.
3. Use the arrow keys to select the RAID volume to be deleted and press Delete.
4. When prompted, press Y to confirm the deletion of the selected RAID volume. Deleting a RAID volume will reset the hard disk drives to non-RAID.
5. After deleting a RAID volume, you can:
   - Return to step 2 to delete additional RAID volumes.
   - See “Creating RAID volumes” on page 33 for RAID volume creation.
   - Use the up and down arrow keys to select **Exit** and press Enter.

Resetting disks to non-RAID

This describes how to reset your hard disk drives to non-RAID.

To reset your hard disk drives to non-RAID, do the following:

1. Press Ctrl+I when prompted to enter the Intel Rapid Storage Technology enterprise option ROM configuration utility during system startup.
2. Use the up and down arrow keys to select **Reset Disks to Non-RAID** and press Enter.
3. Use the arrow keys and the space key to mark individual physical hard disk drives to be reset, and then press Enter to complete the selection.
4. When prompted, press Y to confirm the reset action.
5. After resetting the hard disk drives to non-RAID, you can:
   - See “Deleting RAID volumes” on page 34 for RAID volume deletion.
   - See “Creating RAID volumes” on page 33 for RAID volume creation.
   - Use the up and down arrow keys to select **Exit** and press Enter.

Updating the firmware

The firmware in the server is periodically updated and the latest firmware is always available for downloading from the Lenovo Web site.

Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to check for the latest level of firmware, such as the BIOS updates and device drivers.

When you replace a device in the server, you might have to either update the server with the latest version of the firmware that is stored in memory on the device or restore the preexisting firmware from a diskette or CD image.

Notes:

- The BIOS ROM file is stored in flash on the system board.
- The onboard SATA software RAID firmware is integrated into the BIOS ROM on the system board.

Using the Firmware Updater program

The Firmware Updater program enables you to maintain your system firmware up-to-date and helps you avoid unnecessary outages.

To update your system firmware using the Firmware Updater program, do the following:

Note: Before distributing the firmware updates to a server, ensure that your server can restart successfully without encountering hardware problems.

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate the Firmware Updater program.
2. Download the ISO image for the Firmware Updater program and the TXT file that contains installation instructions.
3. Use any CD or DVD burning software to create a bootable disc with the ISO image.
4. Print the TXT file and follow the instructions to use the Firmware Updater program to update your system firmware.

Chapter 6. Installing, removing, or replacing hardware

This chapter provides instructions on how to install, remove, or replace hardware for your server.

This chapter contains the following topics:

- "Guidelines" on page 37
- "Removing the server cover" on page 39
- "Removing and reinstalling the front bezel" on page 40
- "Installing, removing, or replacing hardware" on page 42
- "Completing the parts replacement" on page 88
- "Installing security features" on page 90

Guidelines

This topic provides some guidelines that you should read and understand before using your server.

Precautions

Before you use the server, ensure that you read and understand the following precautions:

- Before using the product, be sure to read and understand the multilingual safety instructions and the Lenovo Limited Warranty (LLW) on the documentation DVD that comes with the product. Reading and understanding the safety instructions reduces the risk of personal injury and damage to your product.
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, go to http://www.lenovo.com/drivers, and then follow the instructions on the Web page. See "Updating the firmware" on page 34 for more information.
- Before you install optional hardware devices, ensure that the server is working correctly. If the server is not working correctly, see Chapter 7 "Troubleshooting and diagnostics" on page 91 to do basic troubleshooting. If the problem cannot be solved, see Chapter 8 "Getting information, help, and service" on page 97.
- Observe good housekeeping in the area where you are working. Put removed covers and other parts in a safe place.
- If you must turn on the server while the server cover is removed, ensure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Ensure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Ensure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to drives.
- Have a small flat-blade screwdriver available.

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- You do not have to turn off the server to install or replace a hot-swap redundant power supply, a hot-swap hard disk drive, or a hot-plug USB device. However, you must turn off the server before performing any step that involves installing, removing, or replacing adapter cables or non-hot-swap devices or components.
- To view the LEDs on the system board and internal components, leave the server connected to power.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- When working inside the server, you might find some tasks easier if you lay the server on its side.

Handling static-sensitive devices

Attention: Do not open the static-protective package that contains the new part until the defective part has been removed from the server and you are ready to install the new part. Static electricity, although harmless to you, can seriously damage server components and parts.

Any server part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

- Use product-specific ESD procedures when they exceed the requirements noted here.
- Ensure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When you handle server parts and components, take these precautions to avoid static-electricity damage:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always carefully handle the parts and other components (such as PCI Express cards, memory modules, system boards, and microprocessors) by edges or frame. Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- Before you replace a new part, touch the static-protective package containing the new part to an unpainted metal part of the server for at least two seconds. This reduces static electricity from the package and your body.
- Remove the new part from the static-protective package and directly install it in the server without placing it on any other surface. If it is hard for you to do this in your specific situation, place the static-protective package of the new part on a smooth, level surface, and then place the new part on the static-protective package.
- Do not place the part on the server cover or other metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Use a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- The use of a grounding system is recommended. For example, it is recommended to wear an electrostatic discharge (ESD) wrist strap, if one is available. Ensure that you work in an ESD-safe area. Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

  Note: The use of a grounding system to guard against ESD damage is desirable but not necessary.

- Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
- When working on a double-insulated or battery-operated system, use an ESD common ground or reference point. You can use coax or connector-outside shells on these systems.
- Use the ground prong of the ac plug on ac-operated servers.

System reliability guidelines

To help ensure proper cooling and system reliability, strictly follow these guidelines:

- Each of the drive bays has a drive or a dummy tray installed.
- If the server supports hot-swap redundant power supplies, each of the power supply bay has a redundant power supply installed, or one bay has a redundant power supply installed while the other bay is covered by a shield.
- Leave adequate space around the server to ensure that the server cooling system works well. Leave approximately 50 mm (2 inches) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, install the server cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- Properly route the cables. For some options, such as PCI Express cards, follow the cabling instructions that come with the options in addition to the instructions in this manual.
- When replacing a hot-swap drive, install the new hot-swap drive within two minutes of removal.
- If your server has air ducts or air baffles, do not remove them while the server is running. Operating the server without the air ducts or air baffles might cause the microprocessor(s) to overheat.
- For servers that support up to two microprocessors, ensure that the second microprocessor socket always contains a microprocessor or is protected by a microprocessor socket cover.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is turned on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an ESD wrist strap or other grounding system when you work inside the server with the power on.

The server supports hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside the server with the power on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils. These items might fall into the server as you lean over it.
- Avoid dropping any metallic objects into the server, such as paper clips, hairpins, and screws.

Removing the server cover

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to remove the server cover.

CAUTION:

Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To remove the server cover, do the following:

1. Remove any media from the drives and turn off all attached devices and the server.
2. Disconnect all power cords from electrical outlets.
3. Disconnect the power cords, Input/Output (I/O) cables, and any other cables that are connected to the server. See “Front view of the server” on page 13 and “Rear view of the server” on page 14.
4. Remove any locking device that secures the server cover, such as a padlock or an integrated cable lock. See “Integrated cable lock” on page 90and “Padlock” on page 90.
5. Remove the two thumbscrews that secure the server cover.
6. Press the cover-release button on the side of the server and slide the cover to the rear of the server to remove the cover.

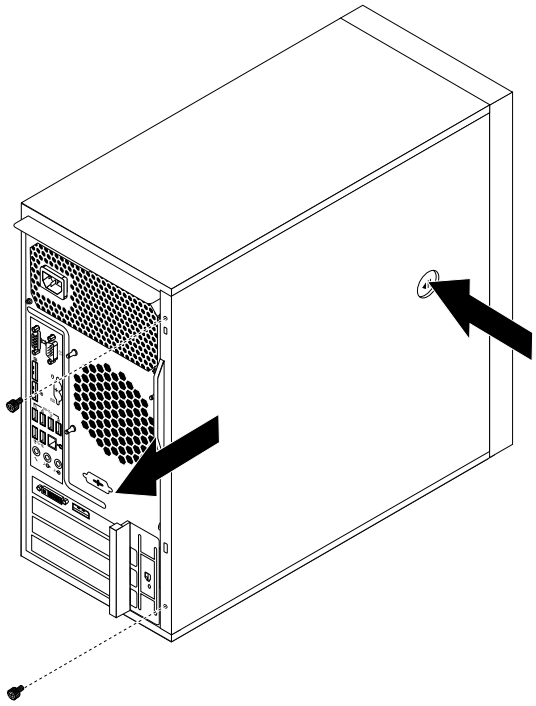


Figure 8. Removing the server cover

Removing and reinstalling the front bezel

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to remove and reinstall the front bezel.

To remove and reinstall the front bezel, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel by releasing the three plastic tabs on the left side and pivoting the front bezel outward.

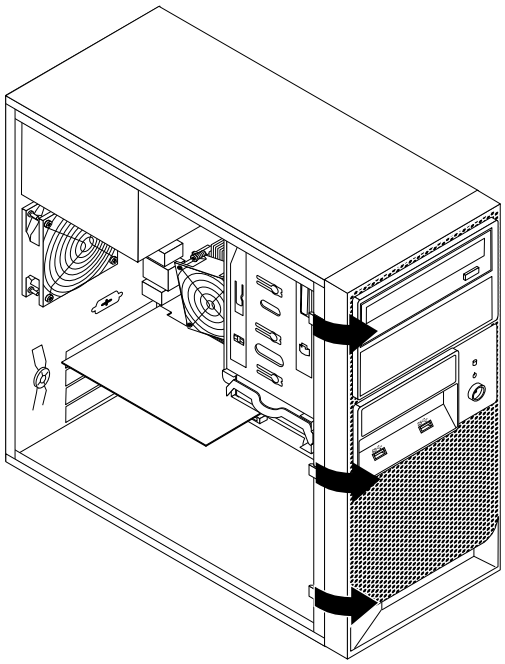


Figure 9. Removing the front bezel

4. To reinstall the front bezel, align the three plastic tabs on the right side of the front bezel with the corresponding holes in the chassis, then pivot the front bezel inward until it snaps into position on the left side.

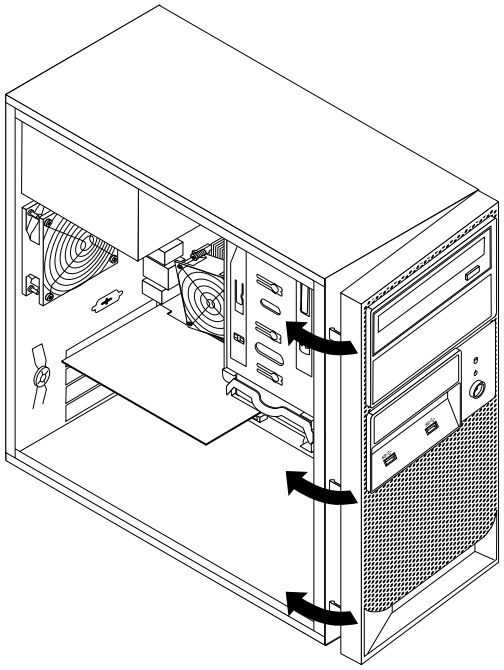


Figure 10. Reinstalling the front bezel

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 88.

Installing, removing, or replacing hardware

This topic provides instructions on how to install, remove, or replace hardware for your server. You can expand the capabilities of your server by adding new hardware devices, such as memory modules or other server options, and maintain your server by replacing the failing hardware devices.

If you are handling a server option, refer to the appropriate installation or removal instructions in this topic along with the instructions that come with the option.

Notes:

- Use only parts provided by Lenovo.
- Depending on the model, your server might look slightly different from the illustrations in this topic.

The EMI integrity and cooling of the server are protected by having all drive bays and PCI Express card slots covered or occupied. When you install an internal drive or a PCI Express card, save the EMI shield or dummy tray from the drive bay or save the PCI Express card slot bracket in the event that you later remove the device.

Attention: An unoccupied drive bay or PCI Express card slot without a cover, shield, dummy tray, filler, or any other protection might impact the EMI integrity and cooling of the server, which might result in overheating or component damage.

Installing or removing the Ethernet card

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to install or remove the Ethernet card. Use any documentation that came with the Ethernet card and follow those instructions in addition to the instructions in this .

To install or remove the Ethernet card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Lay the server on its side for easier operation.
4. The Ethernet card is a kind of PCI card. See “Installing or replacing a PCI card” on page 60 and follow those instructions to install or remove the Ethernet card.
5. If you are instructed to return the removed Ethernet card to the manufacturer, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

If you are using the Microsoft Windows operating systems, you need to install the device driver for the Ethernet card. To install the device driver on Windows operating systems, do the following:

1. Save any open documents and exit all applications.
2. Insert the *ThinkServer EasyStartup* DVD that came with your server into the DVD drive.

   Note: You do not need to use the driver disc that came with the Ethernet card.
3. Right-click **My Computer** and select **Properties**. The System Properties window opens.
4. On the **Hardware** tab, click the **Device Manager** button. The Device Manager window opens.
5. Expand **Network adapters** and then right-click one of the Ethernet cards (PRO/1000PT or the yellow question mark).
6. Select **Update Driver...**. The Hardware Update Wizard program opens.
7. Select **Install the software automatically (Recommended)** and click **Next** to continue.
8. Follow the instructions on the screen.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 88.

Installing or removing a memory module

This topic provides instructions on how to install or remove a memory module.

Note: The memory modules are extremely sensitive to ESD. Make sure that you read and understand “Handling static-sensitive devices” on page 38 first and carefully perform the operation.

Memory module installation rules

Your server has four memory slots and it has the following features:

- Each slot supports 2 GB and 4 GB DDR3 unbuffered dual inline memory modules (UDIMMs) with Error Checking and Correcting (ECC) technology.
- The minimum system memory is 2 GB (only one 2 GB memory module installed in the DIMM2 slot).

- The maximum system memory is 32 GB (one 8 GB memory module installed in each of the four memory slots).

For more information about the memory modules in your specific server model, use the Setup Utility program. See “Viewing information in the Setup Utility program” on page 21.

For a list of supported ThinkServer memory module options, go to: http://www.lenovo.com/thinkserver

The following illustration helps you to locate the memory slots on the system board.

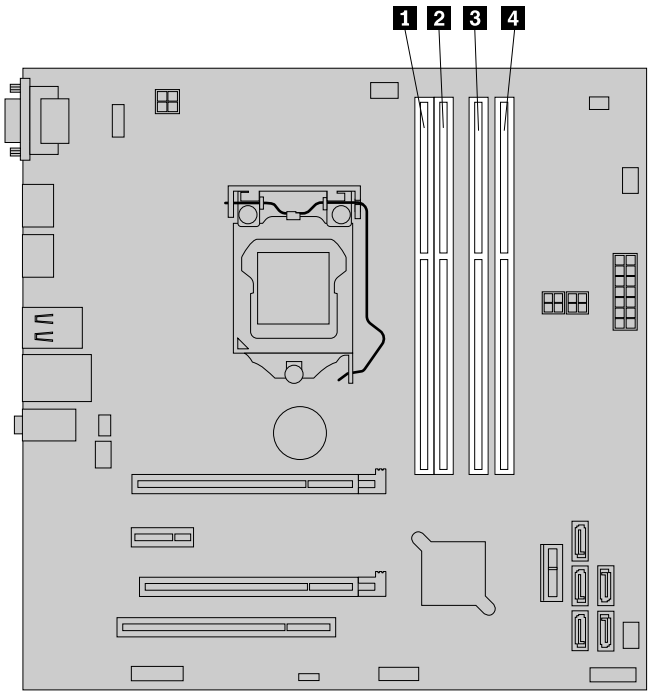


Figure 11. Memory slots on the system board

1 Memory slot (DIMM1)	3 Memory slot (DIMM3)
2 Memory slot (DIMM2)	4 Memory slot (DIMM4)

The following table explains the memory module installation rules for your server. The “X” mark indicates the memory slots into which the memory modules should be installed in different situations.

Note: The installed memory modules must be the same type with the same voltage and frequency.

Table 1. Memory module installation rules

DIMM	DIMM1	DIMM2	DIMM3	DIMM4
One DIMM		X		
Two DIMMs		X		X
Three DIMMs	X	X		X
Four DIMMs	X	X	X	X

Installing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to install a memory module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

1. To optimize system performance, make sure that you consider and follow the memory module installation rules when performing the operation. See “Memory module installation rules” on page 43.
2. Use any documentation that comes with the memory module and follow those instructions in addition to the instructions in this topic.

To install a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Lay the server on its side for easier operation.
4. Locate the memory slots on the system board. See “Locating parts on the system board” on page 16.
5. Remove any parts or disconnect any cables that might prevent your access to the memory slots. Depending on your server model, you might need to remove the PCI Express x16 card for easier access to the memory slots. See “Installing or replacing a PCI card” on page 60
6. Open the retaining clips of the appropriate memory slot. See “Memory module installation rules” on page 43 for the installation sequence information.

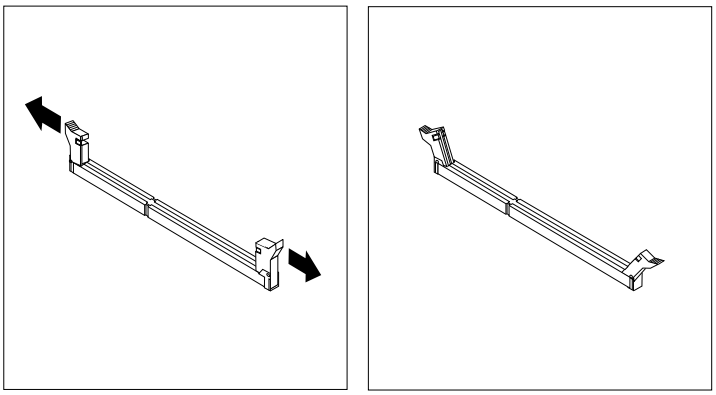


Figure 12. Opening the retaining clips of the memory slots

7. Touch the static-protective package that contains the new memory module to any unpainted surface on the outside of the server. Then, take the new memory module out of the package.

   Note: Carefully handle the memory module by its edges.

8. Position the new memory module over the memory slot. Make sure that the notch 1 on the new memory module is aligned with the key 2 in the memory slot. Then, press the new memory module straight down into the memory slot until the retaining clips close and the new memory module snaps into position.

   Note: If there is a gap between the memory module and the retaining clips, the memory module has not been correctly installed. Open the retaining clips, remove the memory module, and then reinstall it into the memory slot until the retaining clips are completely closed.

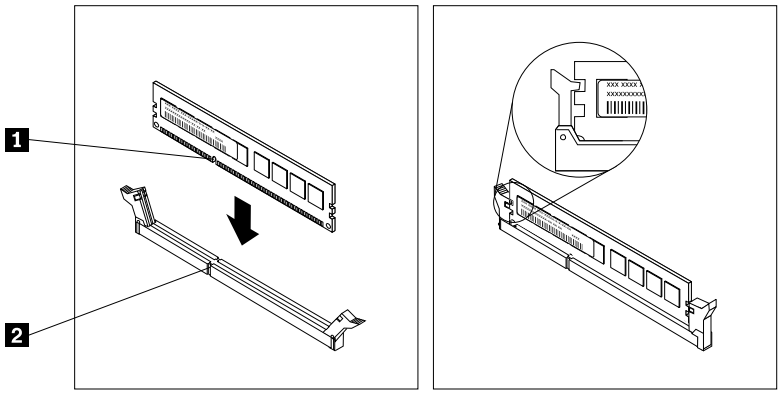


Figure 13. Installing a memory module

9. Reinstall any parts or reconnect any cables you have removed.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to "Completing the parts replacement" on page 88.

Removing a memory module

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 37.

This topic provides instructions on how to remove a memory module.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Note: To optimize system performance, make sure that you consider and follow the memory module installation rules when performing the operation. See "Memory module installation rules" on page 43.

To remove a memory module, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 39.
3. Lay the server on its side for easier operation.
4. Locate the memory slots on the system board. See "Locating parts on the system board" on page 16.
5. Remove any parts or disconnect any cables that might prevent your access to the memory slots.

6. Locate the appropriate memory module that you want to remove and open the retaining clips on both ends of the memory slot. Then, grasp the memory module by its edges and carefully pull it straight up to remove it from the memory slot.

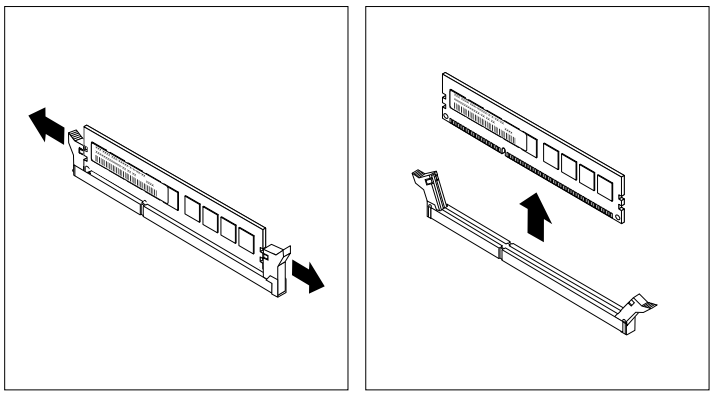


Figure 14. Removing a memory module

7. If you are instructed to return the old memory module, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to "Completing the parts replacement" on page 88.

Installing the 2.5-inch solid-state drive or hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 37.

This topic provides instructions on how to install the 2.5-inch solid-state drive or hard disk drive into a 3.5-inch hard-disk-drive bracket.

Note: Ensure that you have a 3.5-inch to 2.5-inch drive adapter and a 3.5-inch hard-disk-drive bracket available before the installation.

To install the 2.5-inch solid-state drive or hard disk drive, do the following:

1. Install the 2.5-inch drive into the 3.5-inch to 2.5-inch drive adapter. Then, install the four screws to secure the 2.5-inch drive to the drive adapter.

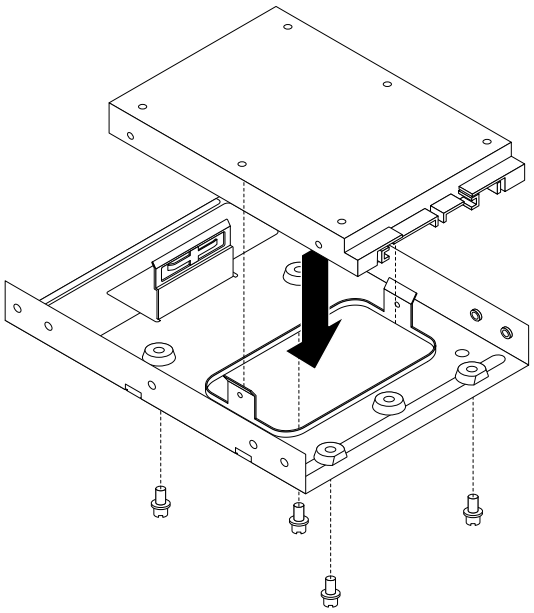


Figure 15. Installing the 2.5-inch drive into the drive adapter

2. To install the 2.5-inch drive with the drive adapter into the 3.5-inch hard-disk-drive bracket, flex the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the drive adapter.

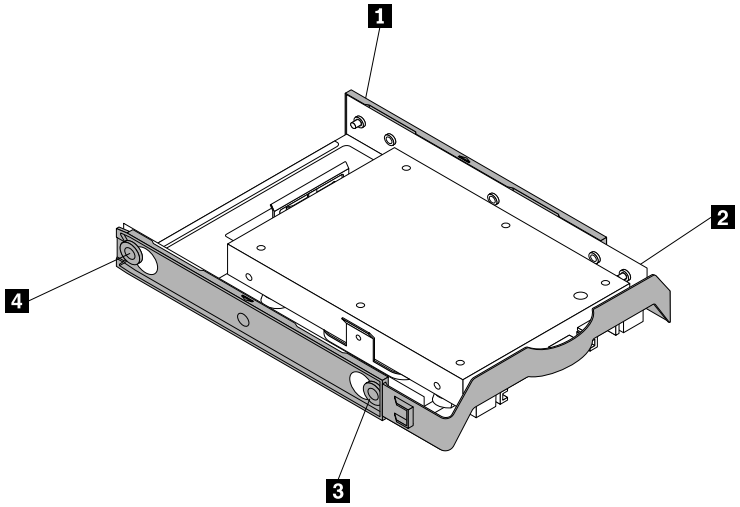


Figure 16. Installing the 2.5-inch drive with the drive adapter into the hard-disk-drive bracket

3. Connect the signal cable and the power cable to the 2.5-inch drive.

4. Install the 2.5-inch drive with the hard-disk-drive bracket into the desired drive bay. Depending on where you want to install the 2.5-inch drive, refer to one of the following topics:
   - “Replacing the primary hard disk drive” on page 70
   - “Installing or replacing the secondary hard disk drive” on page 68
   - “Installing or removing the tertiary hard disk drive” on page 49
   - “Installing or removing the slim optical drive and the fourth hard disk drive” on page 54

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 88.

Installing or removing the tertiary hard disk drive

This topic provides instructions on how to install or remove the tertiary hard disk drive.

Note: For a 2.5-inch hard disk drive or solid-state drive, install the drive into a 3.5-inch to 2.5-inch drive adapter first. See “Installing the 2.5-inch solid-state drive or hard disk drive” on page 47.

Installing the tertiary hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

You can install a tertiary 3.5-inch hard disk drive into the secondary optical drive bay of your server.

This topic provides instructions on how to install the tertiary hard disk drive.

To install the tertiary hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.

4. Install the hard disk drive into the 5.25-inch to 3.5-inch drive conversion bracket. Then, install the four screws to secure the hard disk drive in the bracket.

   Note: You can obtain a 5.25-inch to 3.5-inch drive conversion bracket from a local computer retailer or by contacting the Customer Support Center.

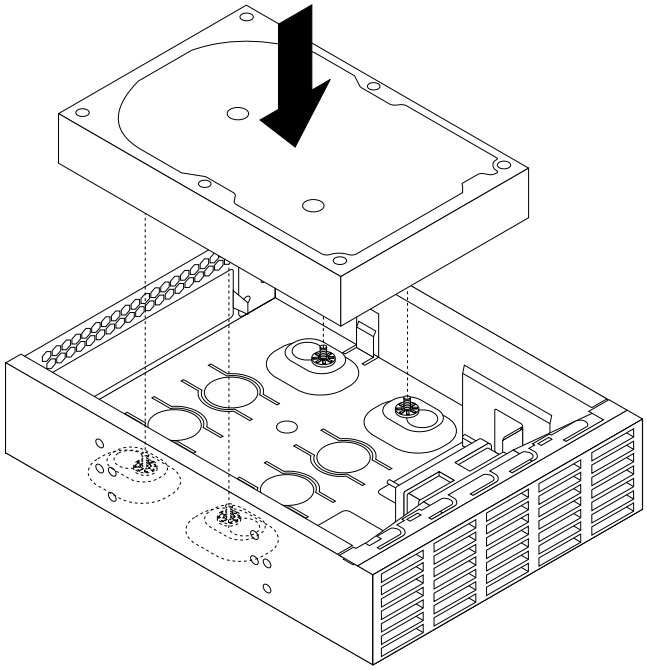


Figure 17. Installing the hard disk drive into the drive conversion bracket

5. Install the retainer on the side of the bracket.

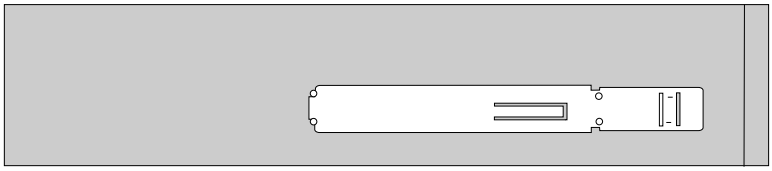


Figure 18. Installing the retainer on the side of the bracket

6. If there is a metal static shield installed in the secondary optical drive bay, remove the metal static shield.

7. Slide the drive conversion bracket into the secondary optical drive bay from the front of the server until the bracket snaps into position.

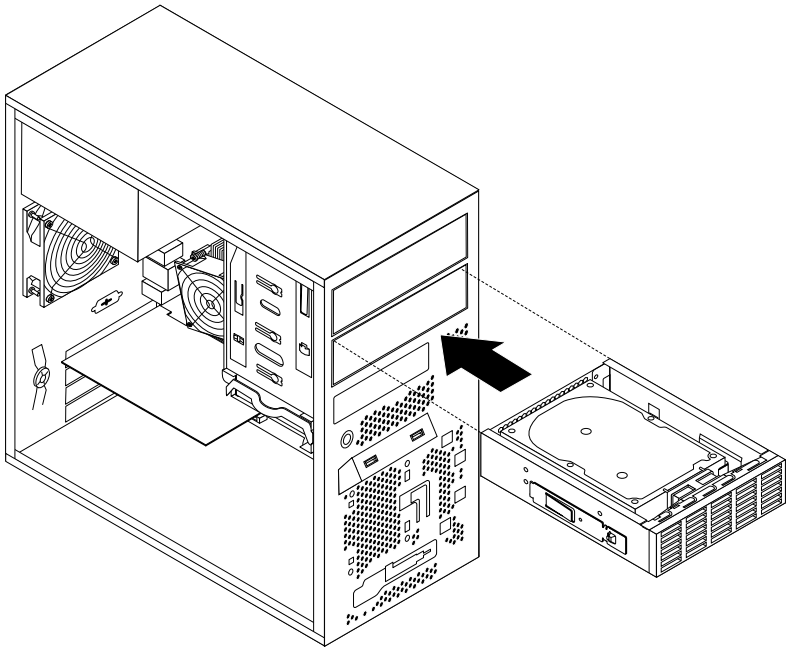


Figure 19. Installing the drive conversion bracket into the secondary optical drive bay

8. Connect the signal cable and the power cable to the rear of the new hard disk drive.

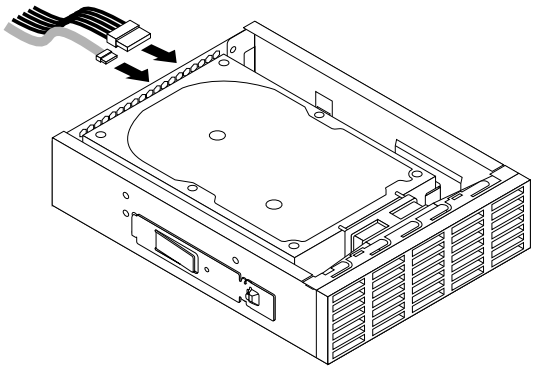


Figure 20. Connecting cables to the hard disk drive

9. Connect the cable of the fan for the tertiary hard disk drive to one of the available connectors **1** of the fan power converter cable. Then, connect the connector **2** to the hard disk drive fan connector on the system board. See “Locating parts on the system board” on page 16.

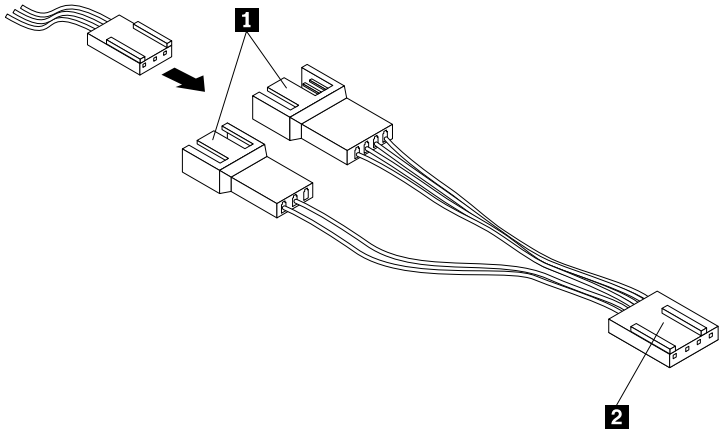


Figure 21. Connecting the cable of the fan for the tertiary hard disk drive

10. Remove the plastic panel that protects the secondary optical drive bay from the front bezel.
11. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 40.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 88.

Removing the tertiary hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to remove the tertiary 3.5-inch hard disk drive.

To remove the tertiary 3.5-inch hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Disconnect the signal cable and the power cable from the rear of the tertiary hard disk drive.
5. Disconnect the cable of the fan for the tertiary hard disk drive from the fan power converter cable.

6. Press the release button **1** and slide the drive conversion bracket with the tertiary hard disk drive out of the front of the server.

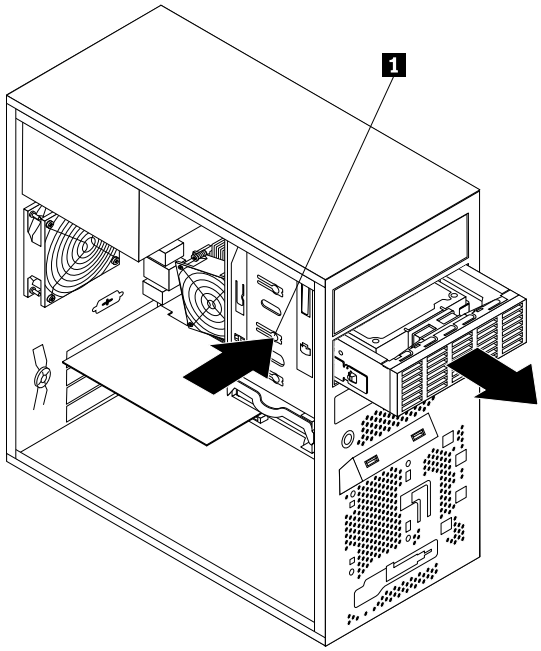


Figure 22. Removing the drive conversion bracket

7. Remove the four screws that secure the hard disk drive. Then, remove the hard disk drive out of the drive conversion bracket.

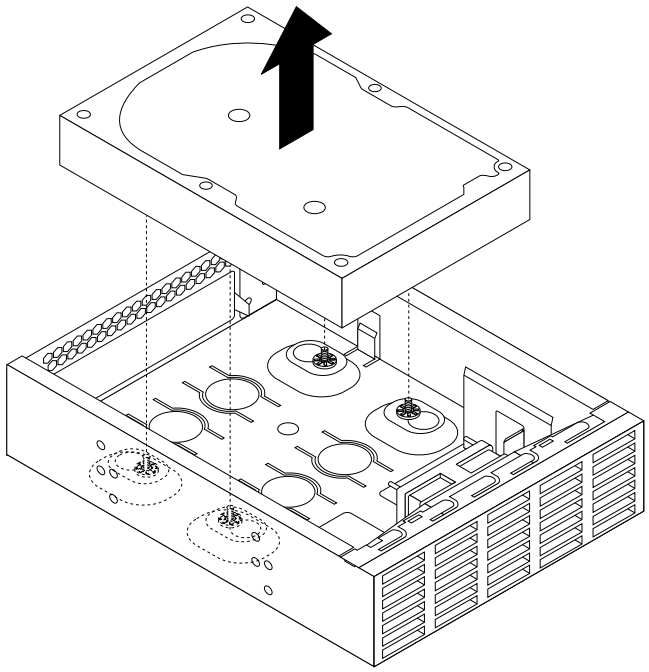


Figure 23. Removing the hard disk drive out of the drive conversion bracket

8. To install a new tertiary hard disk drive, see “Installing the tertiary hard disk drive” on page 49.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 88.

Installing or removing the slim optical drive and the fourth hard disk drive

This topic provides instructions on how to install or remove the slim optical drive and the fourth hard disk drive.

Note: For a 2.5-inch hard disk drive or solid-state drive, install the drive into a 3.5-inch to 2.5-inch drive adapter first. See “Installing the 2.5-inch solid-state drive or hard disk drive” on page 47.

Installing the slim optical drive and the fourth hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

You can install a slim optical drive and a fourth hard disk drive into the optical drive bay of your server.

This topic provides instructions on how to install the slim optical drive and the fourth hard disk drive into the optical drive bay.

To install the slim optical drive and the fourth hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Install the slim optical drive conversion board into the cage for the slim optical drive and the fourth hard disk drive. Then, install the two screws to secure the slim optical drive conversion board.

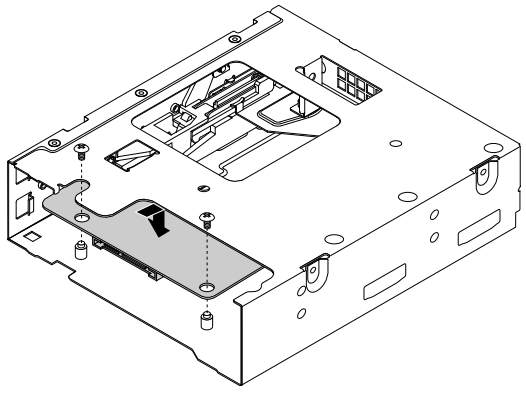


Figure 24. Installing the slim optical drive conversion board

5. Install the two screws to secure the slim optical drive retainer to the side of the slim optical drive.

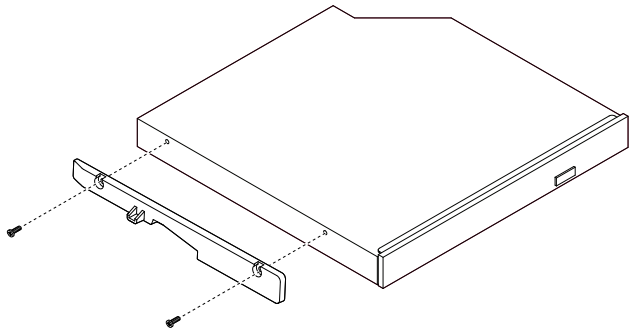


Figure 25. Installing the slim optical drive retainer

6. Install the slim optical drive with the retainer into the cage.

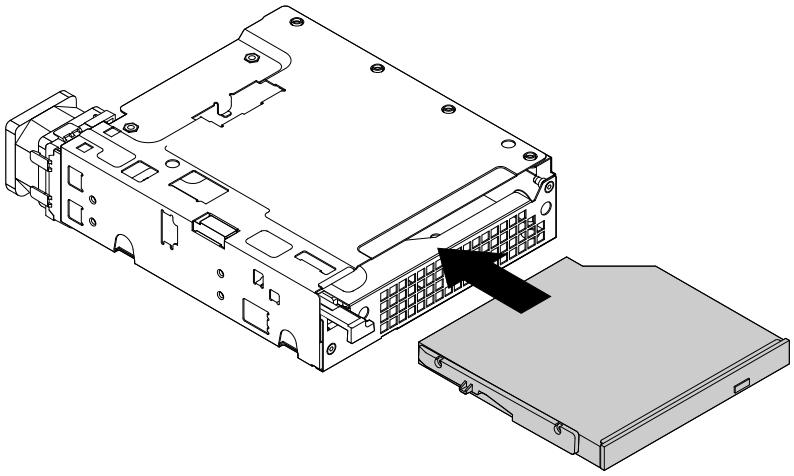


Figure 26. Installing the slim optical drive into the cage

7. Press the tab at the front of the cage until you hear a click. The slim optical drive is secured in place.

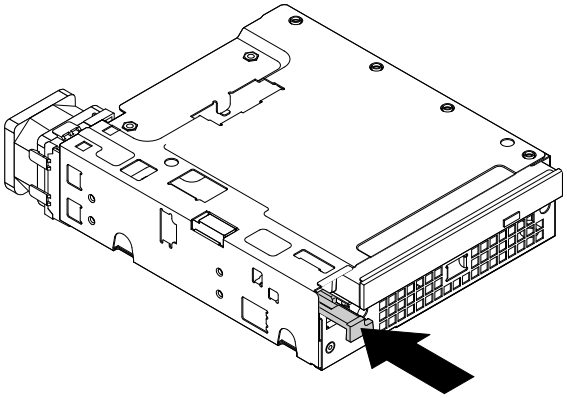


Figure 27. Securing the slim optical drive in the cage

8. Slide the hard disk drive into the cage from the rear of the cage.

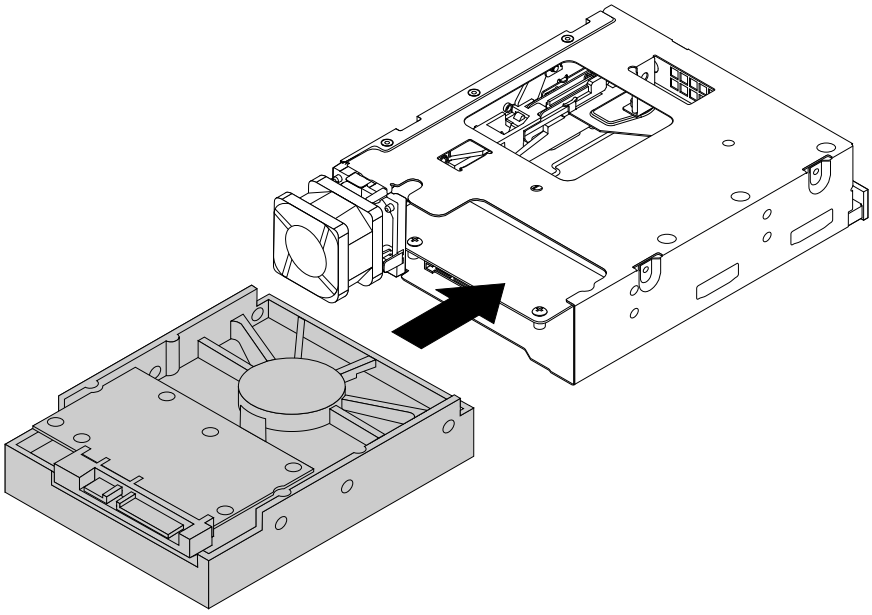


Figure 28. Sliding the hard disk drive into the cage

9. Install the four screws to secure the hard disk drive in the cage.

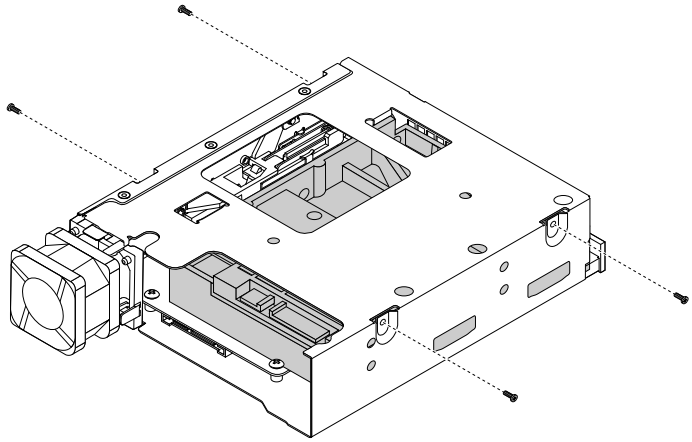


Figure 29. Installing the screws to secure the hard disk drive in the cage

10. Install the cage retainer on the side of the cage.

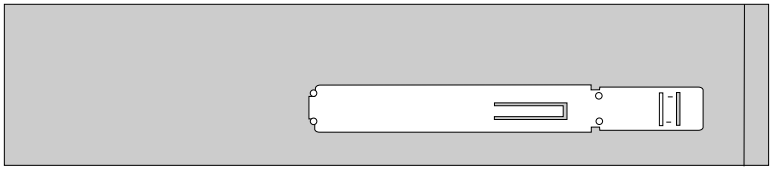


Figure 30. Installing the cage retainer

11. Slide the cage with the slim optical drive and the hard disk drive into the optical drive bay from the front of the server until the cage snaps into position.

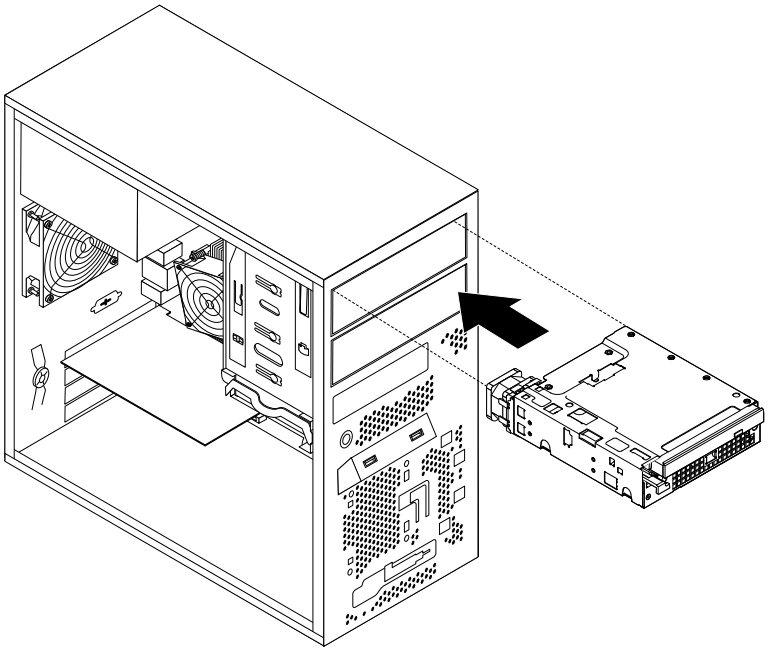


Figure 31. Sliding the cage into the optical drive bay

12. Connect the signal cables and the power cables to the slim optical drive and the hard disk drive.
13. Connect the cable of the fan for the fourth hard disk drive to the hard disk drive fan connector on the system board. See “Locating parts on the system board” on page 16.

    Note: If your server has a tertiary hard disk drive installed, the fan power converter cable connector **2** is connected to the hard disk drive fan connector on the system board. Connect the cable of the fan for the fourth hard disk drive to one of the available connectors **1** of the fan power converter cable.

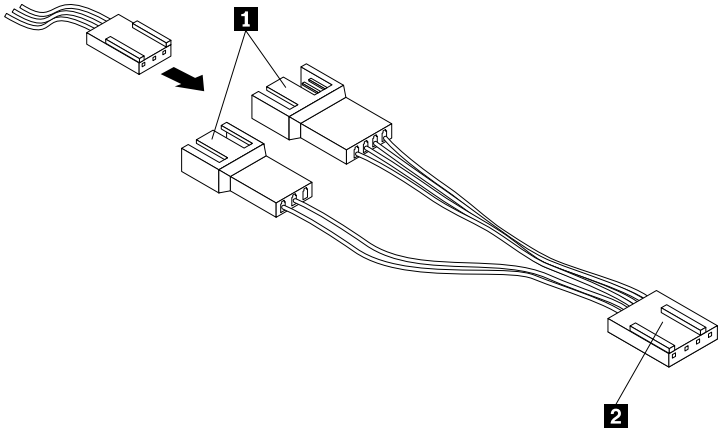


Figure 32. Connecting the cable of the fan for the fourth hard disk drive

14. Install the plastic bezel for the cage onto the front bezel.
15. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 40.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation, go to “Completing the parts replacement” on page 88.

Removing the slim optical drive and the fourth hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to remove the slim optical drive and the fourth hard disk drive.

To remove the slim optical drive and the fourth hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Disconnect the signal cables and the power cables from the slim optical drive and the fourth hard disk drive.
5. Disconnect the cable of the fan for the fourth hard disk drive from the hard disk drive fan connector on the system board. See “Locating parts on the system board” on page 16.

   Note: If your server has a tertiary hard disk drive installed, disconnect the cable of the fan for the fourth hard disk drive from the fan power converter cable.
6. Press the release button 1 and slide the cage with the slim optical drive and the fourth hard disk drive out of the front of the server.

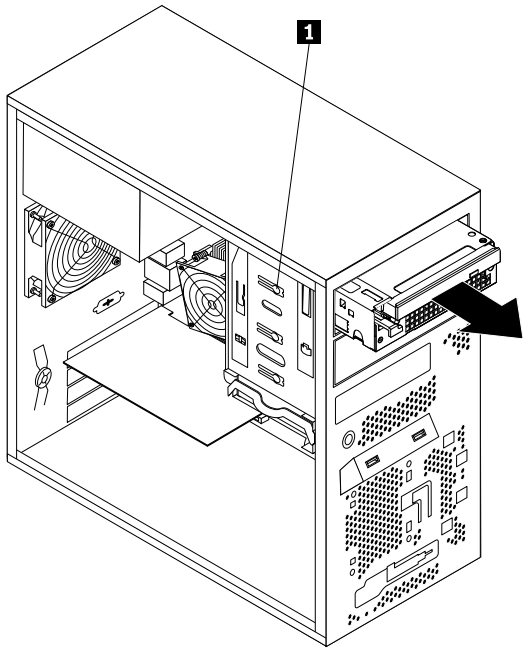


Figure 33. Removing the cage with the slim optical drive and the fourth hard disk drive

7. Press the release button 1 to eject the tab 2 that secures the slim optical drive. Then, slide the slim optical drive out of the front of the cage.

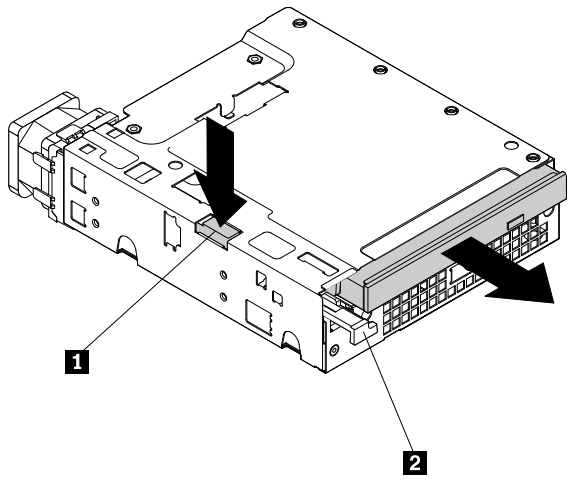


Figure 34. Removing the slim optical drive from the cage

8. Remove the slim optical drive retainer by removing the two screws that secure the retainer.

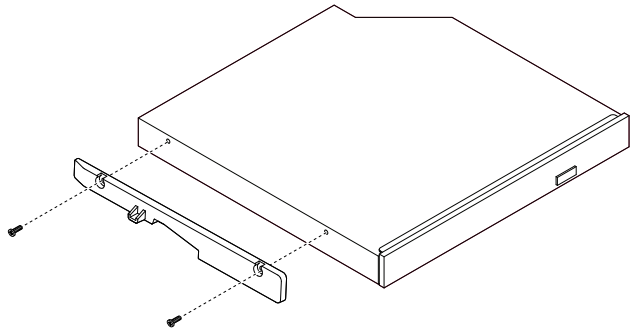


Figure 35. Removing the slim optical drive retainer

9. Remove the four screws that secure the hard disk drive. Then, slide the hard disk drive out of the rear of the cage.

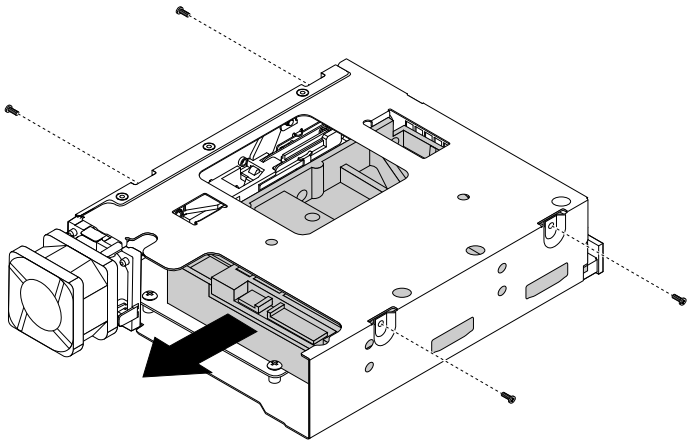


Figure 36. Removing the hard disk drive from the cage

10. To install a new slim optical drive and a new fourth hard disk drive, see “Installing the slim optical drive and the fourth hard disk drive” on page 54.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the removal procedure, go to “Completing the parts replacement” on page 88.

Installing or replacing a PCI card

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to install or replace a PCI card.

Your server has one standard PCI card slot, one PCI Express x1 card slot, one PCI Express x4 card slot, and one PCI Express x16 card slot.

To install or replace a PCI card, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.

3. At the rear of the server, press the release button **1** to open the PCI card latch **2**.

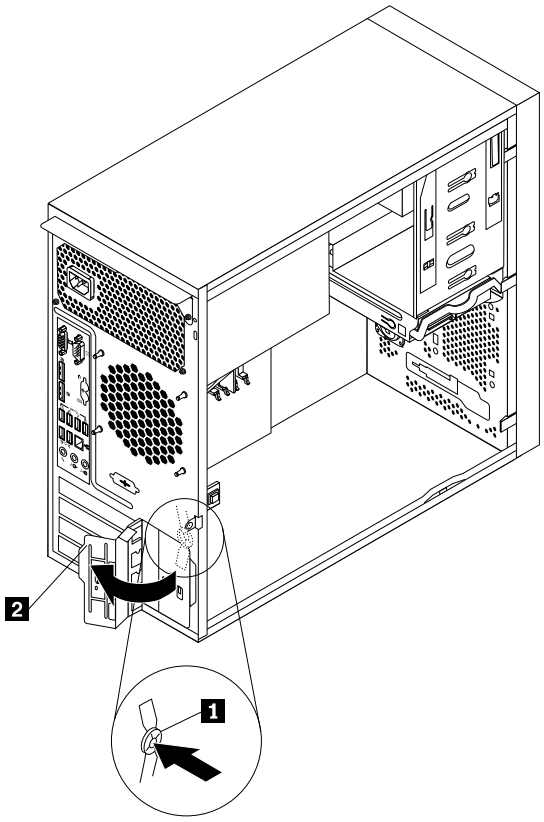


Figure 37. Opening the PCI card latch

4. If you are installing a PCI card, remove the appropriate metal slot cover. If you are replacing an old PCI card, grasp the old card that is currently installed and gently pull it out of the slot.

   Notes:

   a. The PCI card fits tightly into the card slot. If necessary, alternate moving each side of the card a small and equal amount until it is completely removed from the card slot.

   b. If the PCI card is held in place by a retaining clip, open the card retaining clip **1** as shown. Grasp the PCI card and gently pull it out of the card slot.

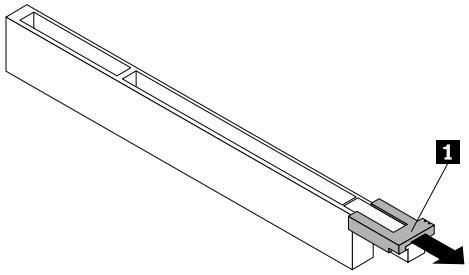


Figure 38. Opening the PCI card retaining clip

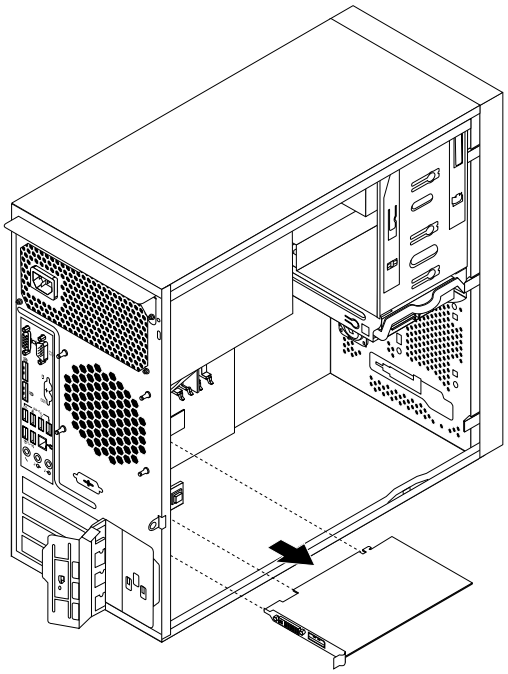


Figure 39. Removing a PCI card

5. Remove the new PCI card from its static-protective package.
6. Install the new PCI card into the appropriate slot on the system board. See “Locating parts on the system board” on page 16.

   Note: If you are installing a PCI Express x16 card, make sure the memory slot retaining clips are closed before you install the PCI Express x16 card.

7. Pivot the PCI card latch to the closed position to secure the PCI card.

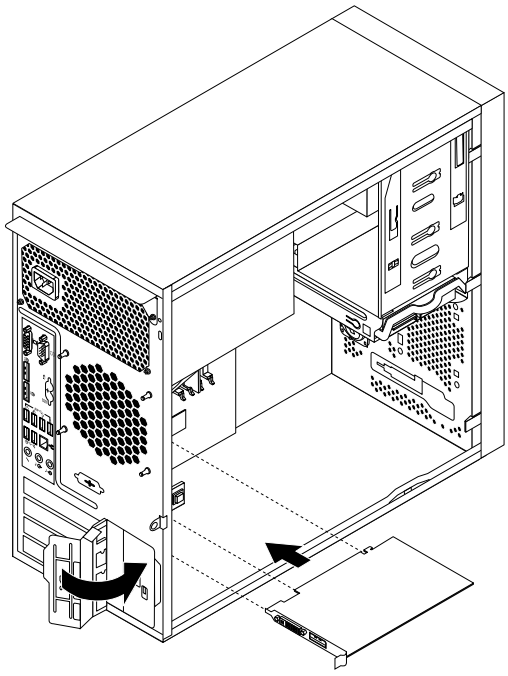


Figure 40. Installing a PCI card

Note: If you are installing a PCI card into a slot with the retaining clip, close the card retaining clip as shown.

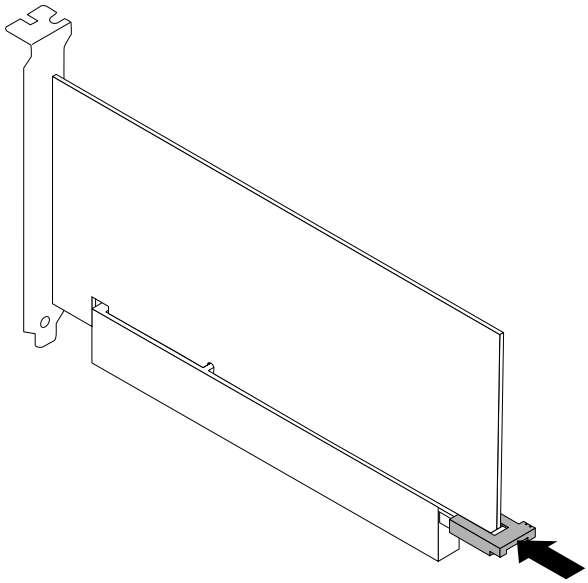


Figure 41. Closing the PCI card retaining clip

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to “Completing the parts replacement” on page 88.

Installing or replacing the optical drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to install or replace the optical drive.

To install or replace an optical drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Depending on whether you are installing or replacing an optical drive, do one of the following:
   - If you are installing a secondary optical drive, remove the plastic panel in the front bezel for the drive bay you want to use. If there is a metal static shield installed in the drive bay, remove the metal static shield.
   - If you are replacing an optical drive, disconnect the signal cable and the power cable from the rear of the optical drive, press the blue release button **1** and then slide the optical drive out of the front of the server.

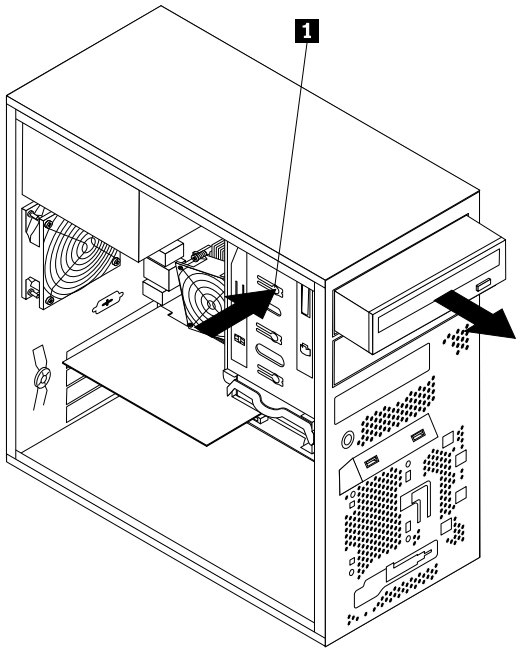


Figure 42. Removing the optical drive

5. Slide the new optical drive with the optical drive retainer 1 installed into the drive bay from the front of the server until the optical drive snaps into position.

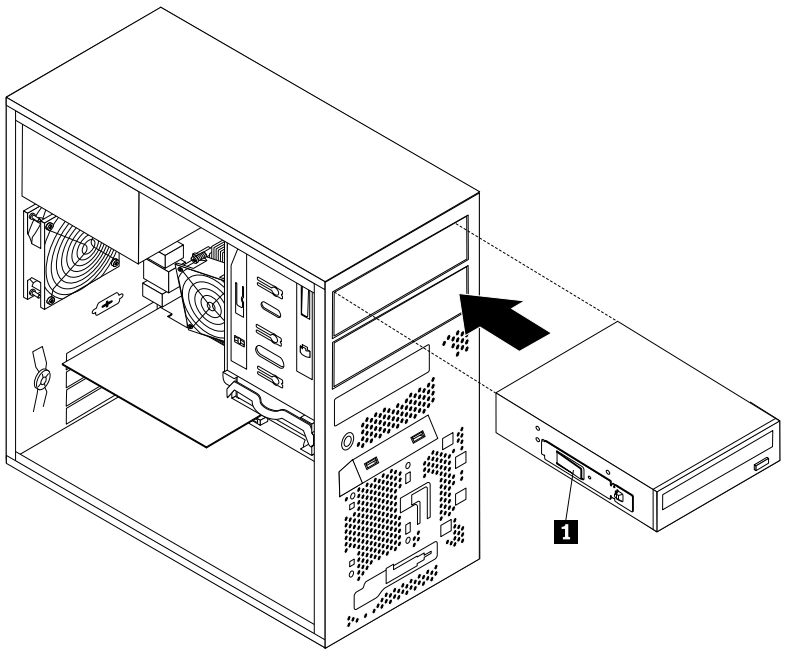


Figure 43. Installing the optical drive

6. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 40.
7. Connect one end of the signal cable to the optical drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 16. Then, locate an available five-wire power connector and connect it to the SATA drive.

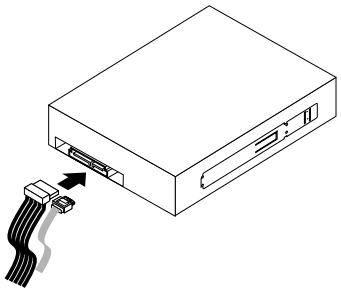


Figure 44. Connecting a SATA optical drive

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the installation or replacement, go to “Completing the parts replacement” on page 88.

Installing or replacing an internal RDX drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

Notes:

- The internal RDX drive must be installed in the secondary optical drive bay.
- Depending on the model, your server might look slightly different from the illustrations in this topic.
- Use any documentation that comes with the RDX drive and follow those instructions in addition to the instructions in this topic.

To install or replace an internal RDX drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Locate the drive bay where you want to install or replace the RDX drive. See “Internal drives” on page 17.
5. Depending on whether you are installing or replacing the RDX drive, do one of the following:
   - If you are installing an RDX drive, remove the plastic panel in the front bezel for the drive bay you want to use. If there is a metal static shield installed in the drive bay, remove the metal static shield.
   - If you are replacing an RDX drive, disconnect the signal cable and the power cable from the rear of the RDX drive, press the blue release button **1** and then slide the RDX drive out of the front of the server.

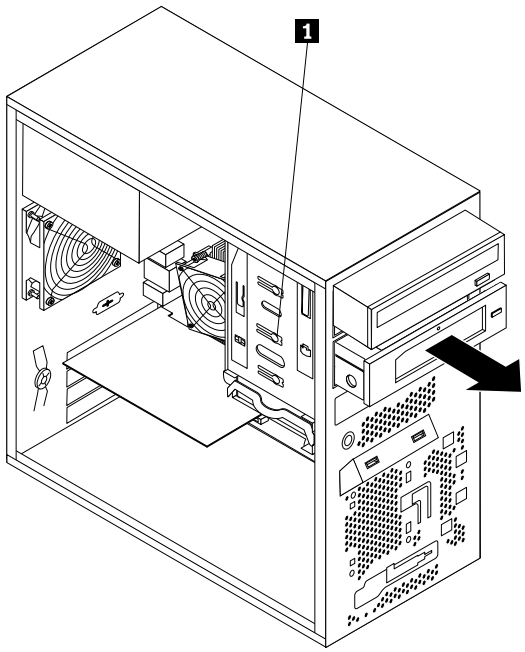


Figure 45. Removing the RDX drive

6. Install the RDX drive retainer 1 on the side of the new RDX drive. Then, slide the new RDX drive with the retainer into the drive bay from the front of the server until the RDX drive snaps into position.

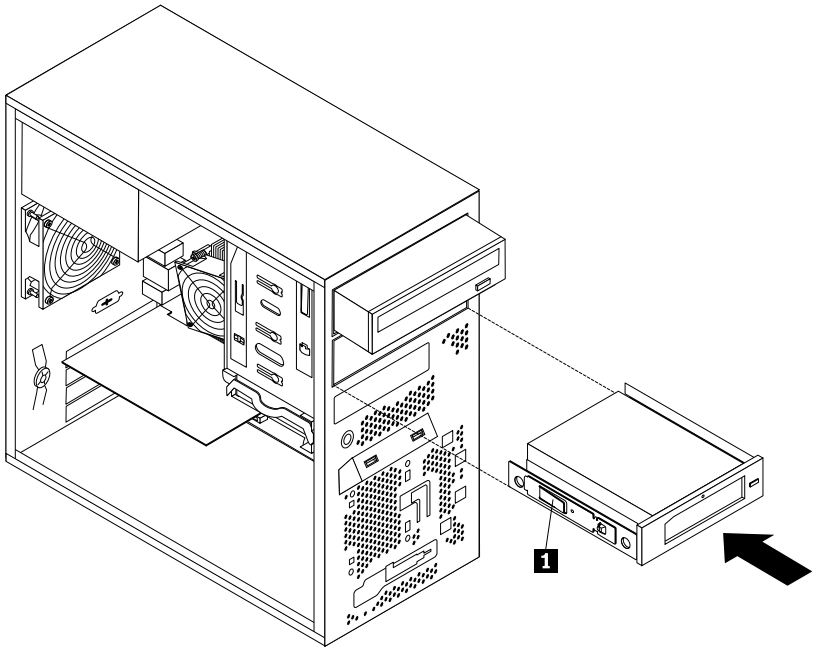


Figure 46. Installing the RDX drive

7. Connect the 4-pin power cable 1 and the signal cable 2 to the rear of the RDX drive. Connect the other end of the power cable 1 to an available optical drive five-wire power connector. Connect the USB connector on the other end of the signal cable 2 to the front USB 2.0 connector on the system board. See “Locating parts on the system board” on page 16.

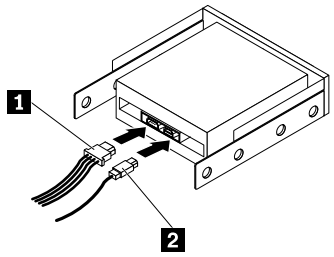


Figure 47. Connecting the RDX drive

8. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 40.
9. Do one of the following:
   - If you are installing an RDX drive, save the removed plastic panel from the front bezel in the event that you later remove the drive and need the plastic panel to cover the drive bay.
   - If you are replacing an RDX drive and are instructed to return the old RDX drive, follow all packaging instructions and use any packaging materials that are supplied to you for shipping.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the installation or replacement, go to “Completing the parts replacement” on page 88.

Installing or replacing the secondary hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to install or replace the secondary hard disk drive.

Note: For a 2.5-inch hard disk drive or solid-state drive, install the drive into a 3.5-inch to 2.5-inch drive adapter first. See “Installing the 2.5-inch solid-state drive or hard disk drive” on page 47.

To install or replace the secondary hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Locate the secondary hard disk drive. See “Locating parts on the system board” on page 16 and “Internal drives” on page 17.
4. If you are replacing the secondary hard disk drive, disconnect the signal cable and the power cable from the hard disk drive.
5. Pull the blue handle to release and remove the hard disk drive from the hard disk drive cage.

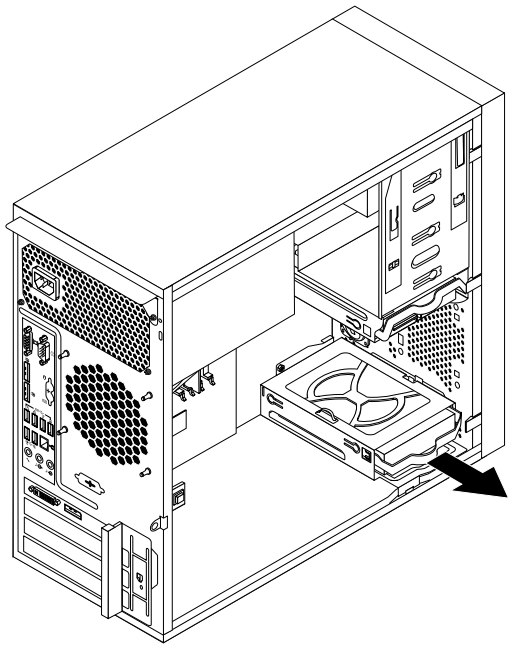


Figure 48. Removing the secondary hard disk drive

6. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
7. To install the secondary hard disk drive, flex the sides of the bracket properly and align pin 1, pin 2, pin 3, and pin 4 on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board 5 on the bottom of the hard disk drive.

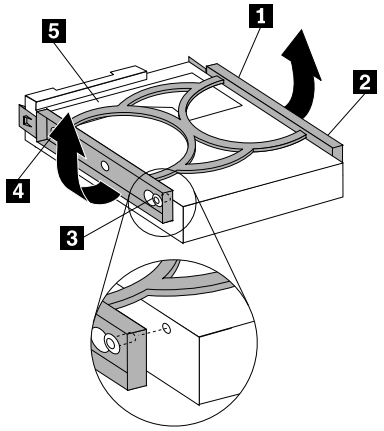


Figure 49. Installing the hard disk drive into the bracket

8. Slide the new hard disk drive into the hard disk drive cage until it snaps into position.

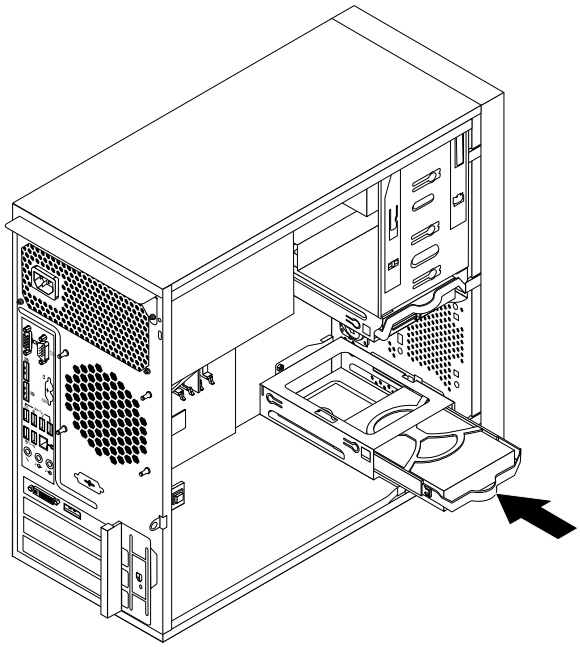


Figure 50. Installing the secondary hard disk drive

9. Connect one end of the signal cable to the hard disk drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 16. Then, locate an available five-wire power connector and connect it to the hard disk drive.

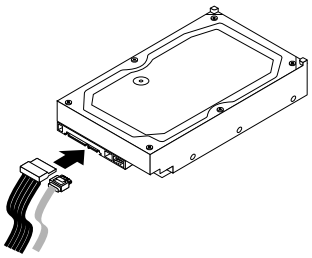


Figure 51. Connecting a SATA hard disk drive

Replacing the primary hard disk drive

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to replace the primary hard disk drive.

Note: For a 2.5-inch hard disk drive or solid-state drive, install the drive into a 3.5-inch to 2.5-inch drive adapter first. See “Installing the 2.5-inch solid-state drive or hard disk drive” on page 47.

To replace the primary hard disk drive, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Locate the primary hard disk drive. See “Locating parts on the system board” on page 16.
4. Disconnect the signal cable and the power cable from the rear of the hard disk drive.

5. Pull the blue handle to release and remove the hard disk drive from the drive cage.

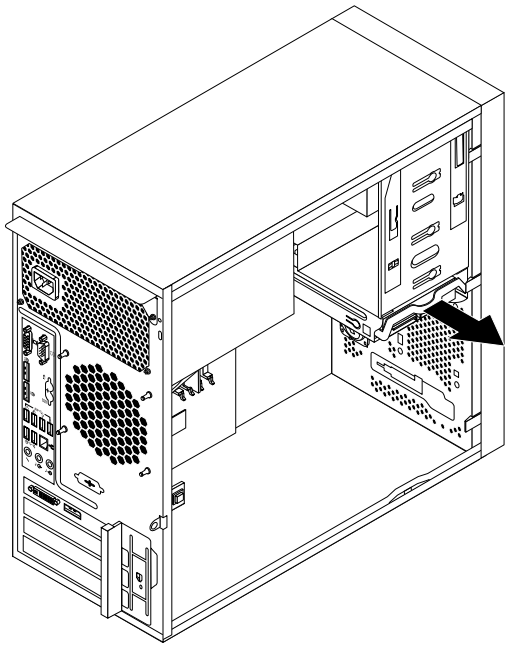


Figure 52. Removing the primary hard disk drive

6. Flex the sides of the blue bracket to remove the hard disk drive from the bracket.
7. To install a new hard disk drive into the blue bracket, flex the sides of the bracket and align pin **1**, pin **2**, pin **3**, and pin **4** on the bracket with the corresponding holes in the hard disk drive. Do not touch the circuit board **5** on the bottom of the hard disk drive.

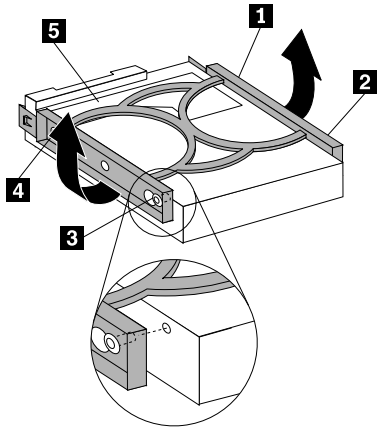


Figure 53. Installing the hard disk drive into the bracket

8. Slide the new hard disk drive into the drive cage until it snaps into position.

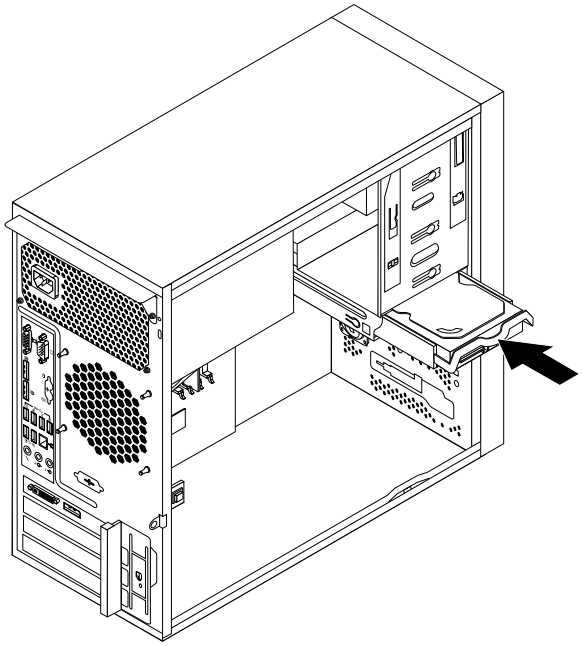


Figure 54. Installing the primary hard disk drive

9. Connect one end of the signal cable to the hard disk drive and the other end to an available SATA connector on the system board. See “Locating parts on the system board” on page 16. Then, locate an available five-wire power connector and connect it to the hard disk drive.

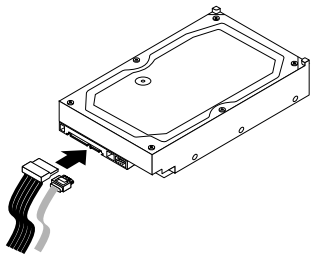


Figure 55. Connecting a SATA hard disk drive

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 88.

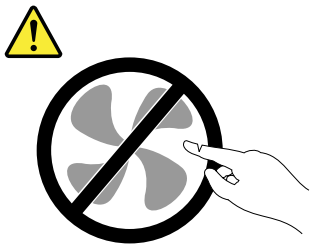
Replacing the power supply assembly

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to replace the power supply assembly.

Although there are no moving parts in your server after the power cord has been disconnected, the following warnings are required for your safety and proper Underwriters Laboratories (UL) certification.

DANGER



Hazardous moving parts. Keep fingers and other body parts away.

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

To replace the power supply assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Lay the server on its side and disconnect the power supply assembly cables from the system board and all drives. See “Locating parts on the system board” on page 16.

4. Remove the four screws at the rear of the chassis that secure the power supply assembly.

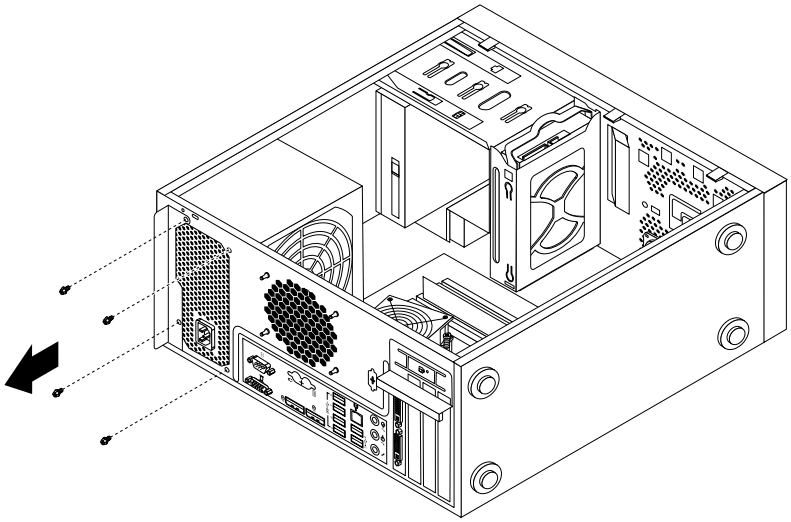


Figure 56. Removing the screws that secure the power supply assembly

5. Slide the power supply assembly a little bit forward and then remove it from the chassis.

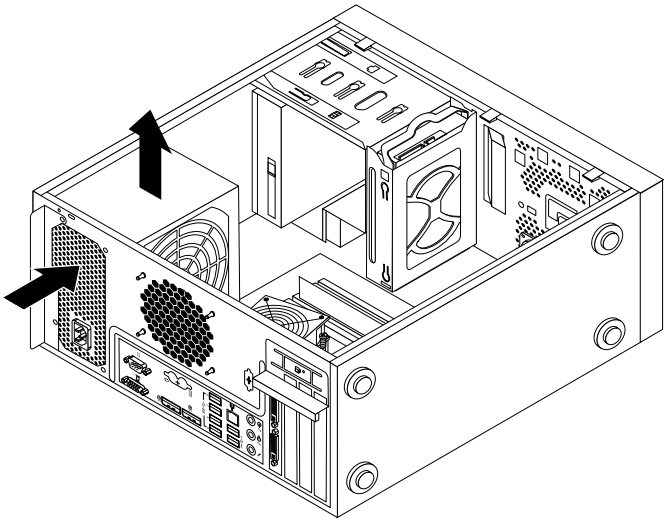


Figure 57. Removing the power supply assembly

6. Ensure that the new power supply assembly is the correct replacement.
7. Install the new power supply assembly into the chassis so that the screw holes in the power supply assembly align with those in the chassis.
8. Install and tighten the four screws to secure the power supply assembly.

   Note: Use only screws provided by Lenovo.
9. Reconnect the power supply assembly cables to the system board and each of the drives.
10. Secure the power supply assembly cables with the cable clips and ties in the chassis.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 88.

Replacing the heat sink and fan assembly

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to replace the heat sink and fan assembly.

CAUTION:

Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To replace the heat sink and fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Lay the server on its side for easier access to the system board.
4. Locate the heat sink and fan assembly. See “Locating parts on the system board” on page 16.
5. Disconnect the heat sink and fan assembly cable from the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 16.

6. Follow this sequence to remove the four screws that secure the heat sink and fan assembly to the system board:
   a. Partially remove screw 1, then fully remove screw 2, and then fully remove screw 1.
   b. Partially remove screw 3, then fully remove screw 4, and then fully remove screw 3.

   Note: Carefully remove the four screws from the system board to avoid any possible damage to the system board. The four screws cannot be removed from the heat sink and fan assembly.

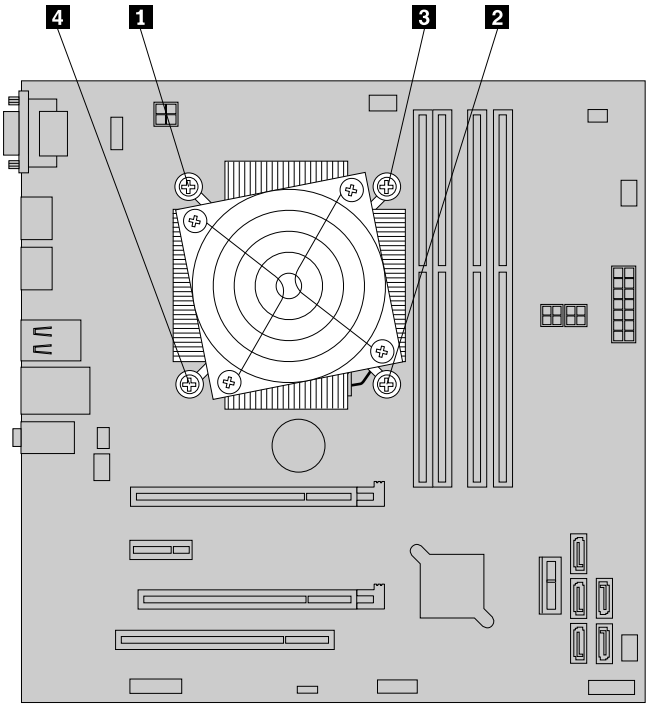


Figure 58. Removing the heat sink and fan assembly

7. Lift the failing heat sink and fan assembly off the system board.

   Notes:
   a. You might have to gently twist the heat sink and fan assembly to free it from the microprocessor.
   b. While handling the heat sink and fan assembly, do not touch the thermal grease on the bottom of it.
8. Place the new heat sink and fan assembly on the system board so that the four screws on the heat sink and fan assembly are aligned with the corresponding holes on the system board. Make sure that you properly place the heat sink and fan assembly so that you can easily connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board.
9. Follow this sequence to install the four screws to secure the new heat sink and fan assembly. See Figure 58 “Removing the heat sink and fan assembly” on page 76.
   a. Partially tighten screw 1, then fully tighten screw 2, and then fully tighten screw 1.
   b. Partially tighten screw 3, then fully tighten screw 4, and then fully tighten screw 3.

   Note: Do not over-tighten the screws.
10. Connect the heat sink and fan assembly cable to the microprocessor fan connector on the system board. See “Locating parts on the system board” on page 16.

What to do next:

- To work with another piece of hardware, go to the appropriate section.

- To complete the replacement, go to “Completing the parts replacement” on page 88.

Replacing the front audio and USB assembly

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to replace the front audio and USB assembly.

To replace the front audio and USB assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Disconnect the front audio and USB assembly cable from the system board. See “Locations” on page 12.
5. Note the front audio and USB assembly cable routing and remove the screw that secures the front audio and USB assembly. Then, remove the front audio and USB assembly from the chassis.

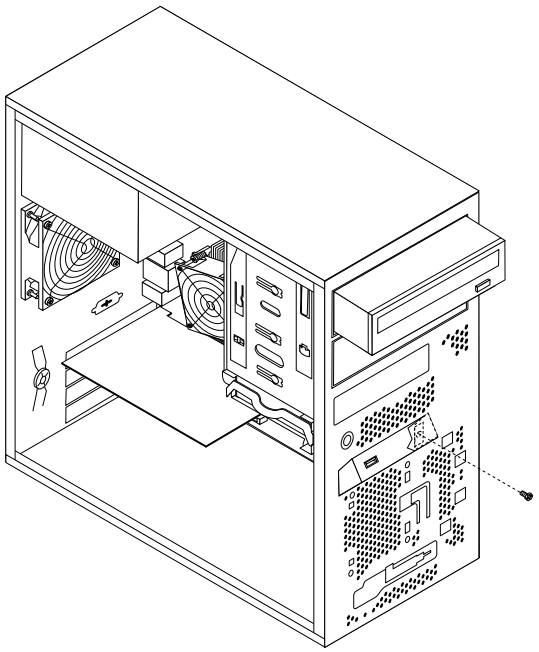


Figure 59. Removing the front audio and USB assembly

6. Route the new front audio and USB assembly through the hole in the chassis.
7. Position the new front audio and USB assembly to the chassis so that the screw hole in the new front audio and USB assembly is aligned with the corresponding hole in the chassis.
8. Install the screw to secure the new front audio and USB assembly in place.
9. Connect the new front audio and USB assembly cables to the system board. See “Locations” on page 12.
10. Reinstall the front bezel. See “Removing and reinstalling the front bezel” on page 40.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 88.

Replacing the front fan assembly

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

Depending on the model type, your server might have a front fan assembly installed. This topic provides instructions on how to replace the front fan assembly.

To replace the front fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Remove the front bezel. See “Removing and reinstalling the front bezel” on page 40.
4. Disconnect the front fan assembly cable from the power fan connector on the system board. See “Locating parts on the system board” on page 16.
5. The front fan assembly is attached to the chassis by four rubber mounts. Remove the front fan assembly by breaking or cutting the rubber mounts and gently pulling the front fan assembly out of the chassis.

   Note: The new front fan assembly will have four new rubber mounts attached.

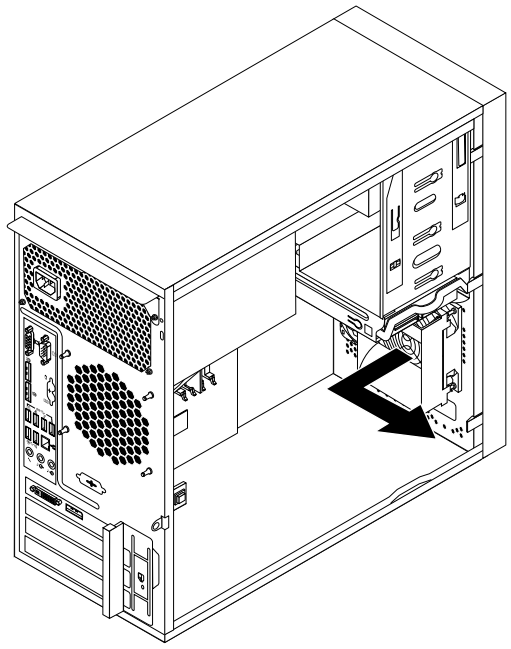


Figure 60. Removing the front fan assembly

6. Install the new front fan assembly by aligning the new rubber mounts with the corresponding holes in the chassis and push the rubber mounts through the holes.

7. Carefully pull on the tips of the rubber mounts until the front fan assembly is secured in place.

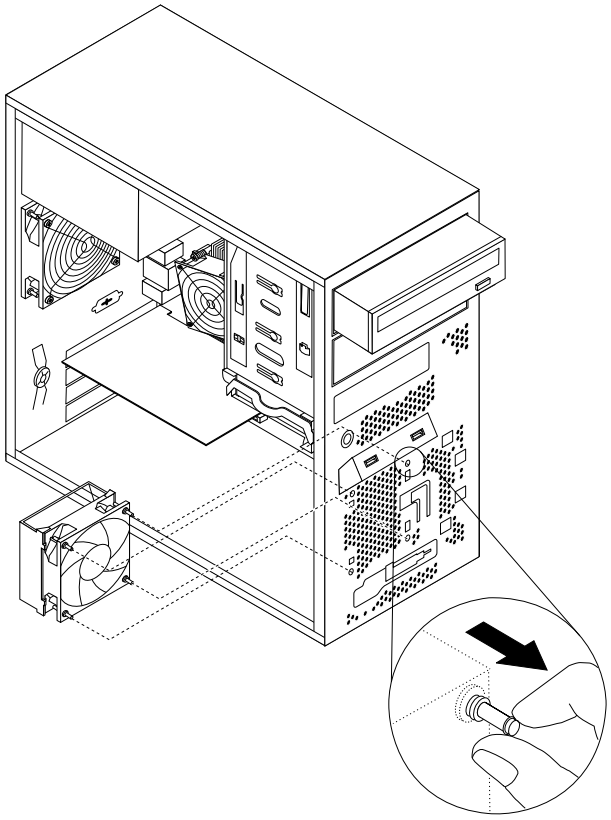


Figure 61. Installing the front fan assembly

8. Connect the new front fan assembly cable to the power fan connector on the system board. See "Locating parts on the system board" on page 16.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 88.

Replacing the rear fan assembly

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 37.

This topic provides instructions on how to replace the rear fan assembly.

To replace the rear fan assembly, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See "Removing the server cover" on page 39.
3. Locate the rear fan assembly. See "Internal components" on page 17.
4. Disconnect the rear fan assembly cable from the system fan connector on the system board. See "Locating parts on the system board" on page 16.

5. The rear fan assembly is attached to the chassis by four rubber mounts. Remove the rear fan assembly by cutting the rubber mounts and gently pulling the rear fan assembly out of the chassis.

   Note: The new rear fan assembly will have four new rubber mounts attached.

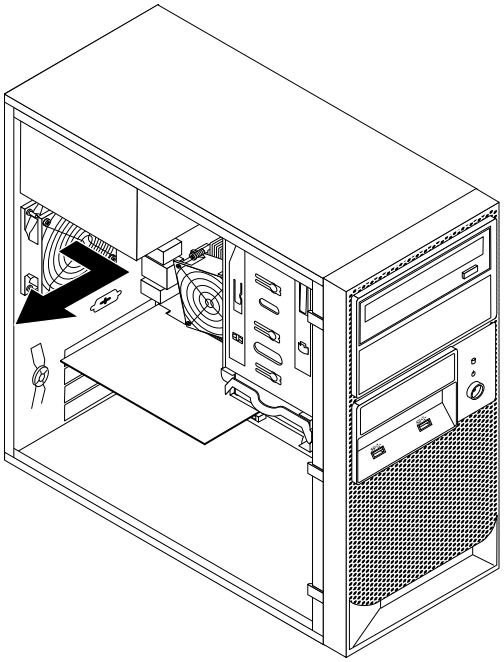


Figure 62. Removing the rear fan assembly

6. Install the new rear fan assembly by aligning the new rubber mounts with the corresponding holes in the chassis and push the rubber mounts through the holes.

7. Carefully pull on the tips of the rubber mounts until the new rear fan assembly is secured in place.

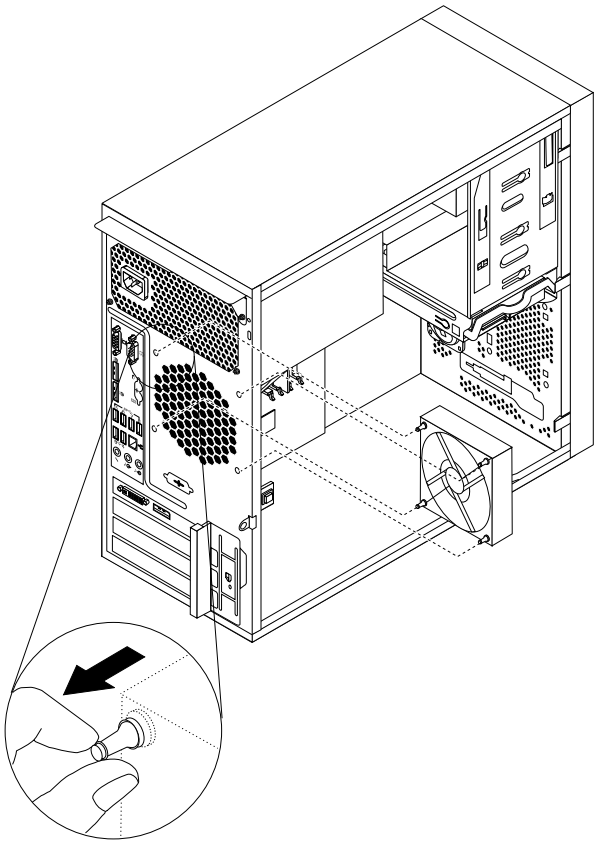


Figure 63. Installing the rear fan assembly

8. Connect the new rear fan assembly cable to the system fan connector on the system board. See "Locating parts on the system board" on page 16.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to "Completing the parts replacement" on page 88.

Replacing the microprocessor

Attention: Do not open your server or attempt any repair before reading and understanding "Safety information" on page iii and "Guidelines" on page 37.

This topic provides instructions on how to replace the microprocessor.

CAUTION:

The heat sink and microprocessor might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To replace the microprocessor, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Lay the server on its side for easier access to the system board.
4. Locate the system board and disconnect all cables connected to the system board. See “Locating parts on the system board” on page 16.
5. Remove the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 75.

   Note: Place the heat sink and fan assembly on its side so that the thermal grease on the bottom of it does not get in contact with anything.
6. Lift the small handle **1** and open the retainer **2** to access the microprocessor **3**.

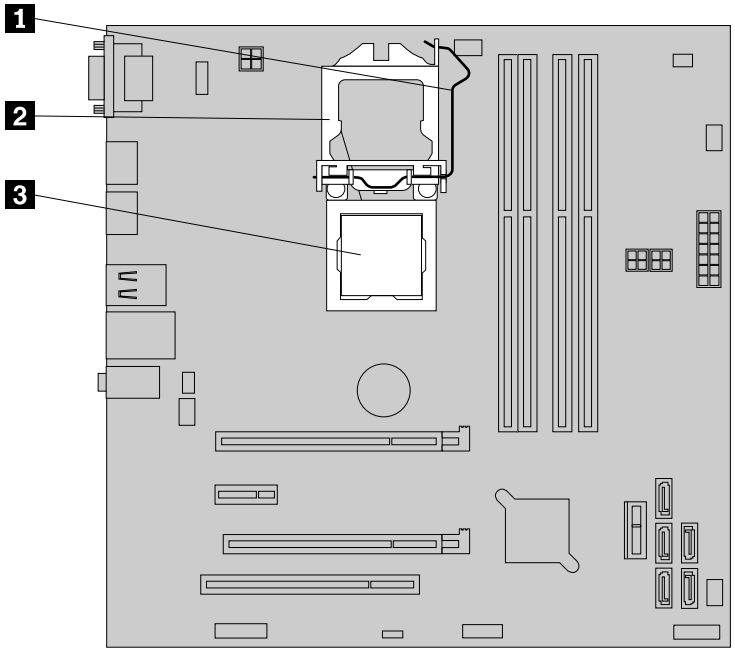


Figure 64. Accessing the microprocessor

7. Lift the microprocessor straight up and out of the microprocessor socket.

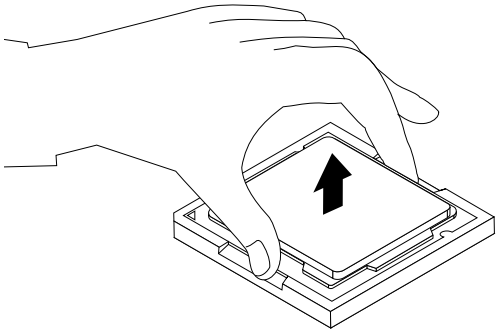
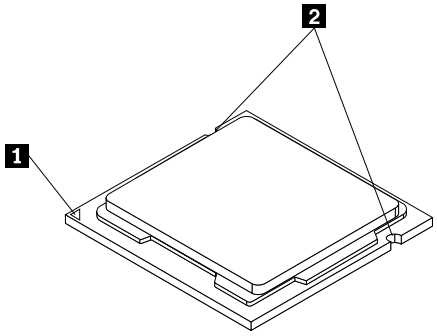


Figure 65. Removing the microprocessor

Notes:

a. Your microprocessor and socket might look different from the one illustrated.

b. Note the orientation of the microprocessor in the socket. You can either look for the small triangle 1 on one corner of the microprocessor or note the orientation of the notches 2 on the microprocessor. This is important when installing the new microprocessor on the system board.



c. Touch only the edges of the microprocessor. Do not touch the gold contacts on the bottom.

d. Do not drop anything onto the microprocessor socket while it is exposed. The socket pins must be kept as clean as possible.

8. Make sure that the small handle is in the raised position and the microprocessor retainer is fully open.
9. Remove the protective cover that protects the gold contacts of the new microprocessor.
10. Hold the new microprocessor by its sides and align the small triangle on one corner of the new microprocessor with the corresponding small triangle on one corner of the microprocessor socket.
11. Lower the new microprocessor straight down into the microprocessor socket on the system board.

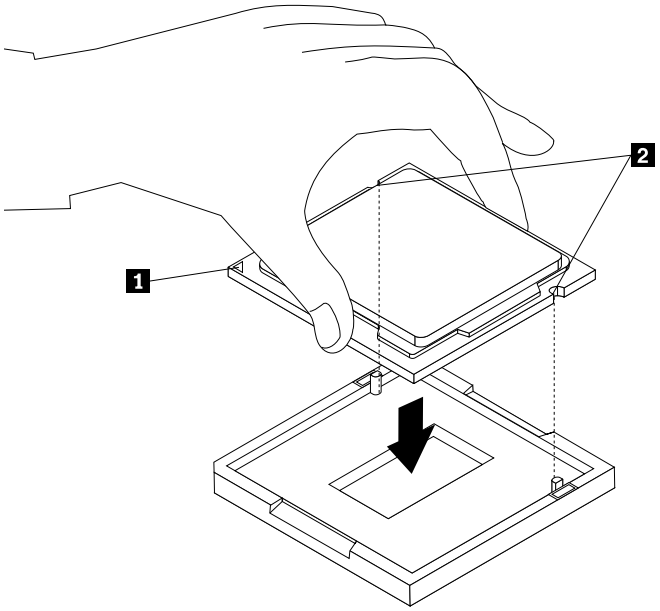


Figure 66. Installing the microprocessor

12. Close the microprocessor retainer and lock it into position with the small handle to secure the new microprocessor in the socket.
13. Reinstall the heat sink and fan assembly. See “Replacing the heat sink and fan assembly” on page 75.

14. Reconnect all cables that were disconnected from the system board.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 88.

Replacing the system board battery

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to replace the system board battery.

Your server has a special type of memory that maintains the date, time, and configuration information for built-in features. The system board battery keeps the information active when you turn off the server. The system board battery normally requires no charging or maintenance throughout its life; however, no battery lasts forever. If the system board battery fails, the date, time, and configuration information, including passwords, are lost and an error message is displayed when you turn on the server.

DANGER

Danger of explosion if battery is incorrectly replaced.

When replacing the lithium coin cell battery, use only the same or an equivalent type that is recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

The following statement applies to users in the state of California, U.S.A.

California Perchlorate Information:

Products containing manganese dioxide lithium coin cell batteries may contain perchlorate.

Perchlorate Material - special handling may apply,
Seehttp://www.dtsc.ca.gov/hazardouswaste/perchlorate

Before you begin, print all the related instructions or ensure that you can view the PDF version on another computer for reference.

To replace the system board battery, do the following:

Note: After you replace the system board battery, you must reset passwords, reset system date and time, and reconfigure the server.

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.

2. Remove the server cover. See “Removing the server cover” on page 39.
3. Locate the system board battery. See “Locations” on page 12.
4. Remove the old system board battery.

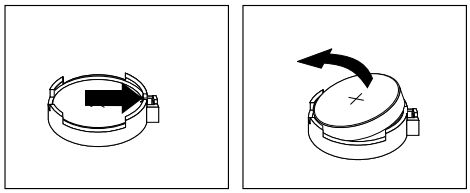


Figure 67. Removing the old system board battery

5. Install the new system board battery.

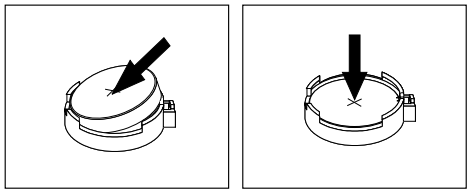


Figure 68. Installing the new system board battery

6. Reinstall the server cover and connect the cables. See “Completing the parts replacement” on page 88.

   Note: When the server is turned on for the first time after the battery is replaced, an error message might be displayed. This is normal after replacing the battery.
7. Turn on the server and all attached devices.
8. Use the Setup Utility program to set the date, time, and any passwords. See Chapter 5 “Configuring the server” on page 21.
9. Dispose of the failing battery as required by local ordinances or regulations.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 88.

Replacing the system board

Attention: Do not open your server or attempt any repair before reading and understanding “Safety information” on page iii and “Guidelines” on page 37.

This topic provides instructions on how to replace the system board.

Note: This procedure must be performed only by trained service personnel of Lenovo.

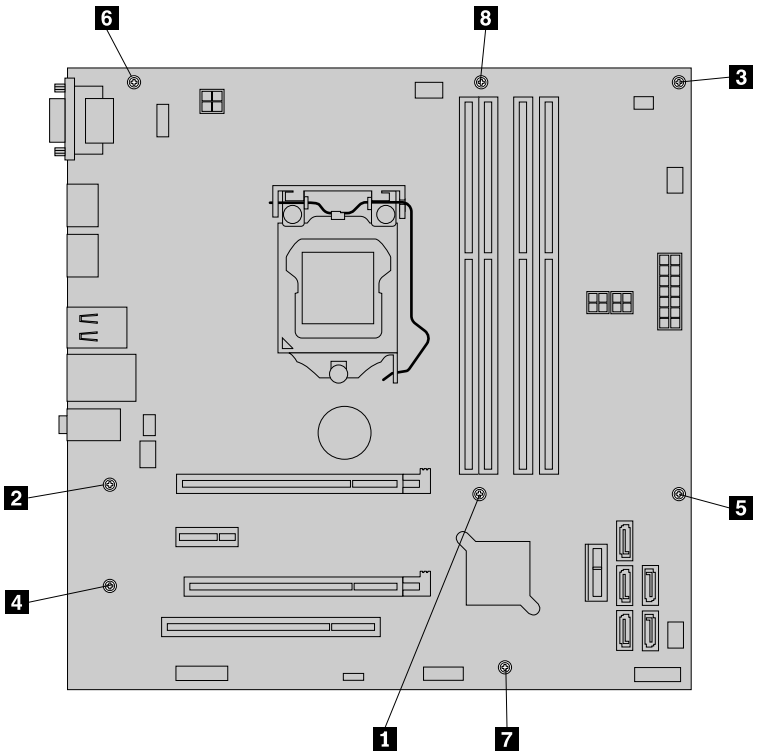
CAUTION:

The heat sink and microprocessor might be very hot. Turn off the server and wait three to five minutes to let the server cool before removing the server cover.

To replace the system board, do the following:

1. Remove all media from the drives and turn off all attached devices and the server. Then, disconnect all power cords from electrical outlets and disconnect all cables that are connected to the server.
2. Remove the server cover. See “Removing the server cover” on page 39.
3. Lay the server on its side for easier access to the system board.
4. Remove all memory modules and PCI cards that are currently installed. See “Installing or removing a memory module” on page 43 and “Installing or replacing a PCI card” on page 60.
5. Remove the heat sink and fan assembly from the failing system board. See “Replacing the heat sink and fan assembly” on page 75.

   Note: Place the heat sink and fan assembly on its side so that the thermal grease on the bottom of it does not get in contact with anything.
6. Remove the microprocessor from the failing system board. See “Replacing the microprocessor” on page 81.
7. Remove the battery from the failing system board. See “Replacing the system board battery” on page 84.
8. Note the location of all cable connections on the system board and disconnect all cables. See “Locating parts on the system board” on page 16.
9. Remove the eight screws that secure the system board to the chassis by following the sequence shown in the following illustration.



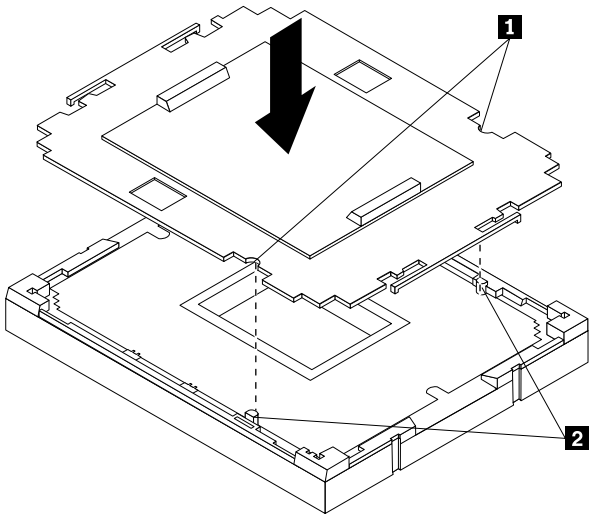
10. Carefully lift the failing system board out of the chassis.
11. Remove the retention module from the bottom of the failing system board and then install it to the new system board.
12. Position the new system board into the chassis so that the screw holes in the new system board are aligned with those in the chassis. Install the eight screws that secure the system board to the chassis in the reverse order that they were removed; that is, install the screw 8 first and install the screw 1 last.
13. Remove the microprocessor socket cover from the new system board.
14. Install the memory modules, PCI cards, battery, microprocessor, and heat sink and fan assembly that you removed from the failing system board to the new system board.

15. Connect all cables to the system board. See “Locating parts on the system board” on page 16.
16. Go to “Completing the parts replacement” on page 88.

The failing system board must be returned with microprocessor socket cover to protect the pins during shipping and handling. Install the microprocessor socket cover removed from the new system board on the failing system board.

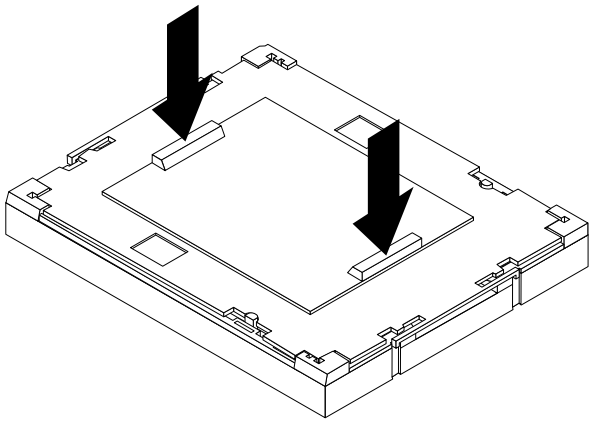
To install a microprocessor socket cover, do the following:

1. Release the lever securing the microprocessor retainer and open the retainer to access the microprocessor.
2. Grasp the microprocessor on the sides and lift it straight up and out of the socket. Do not touch the contacts on the microprocessor socket.
3. Align the notches **1** of the microprocessor socket cover with the alignment keys **2** of the microprocessor socket. Lower the socket cover straight down into the microprocessor socket on the system board.



Note: Your microprocessor socket and cover might look slightly different from the illustration.

4. Carefully press the socket cover straight down until it is secured in the socket.



5. Lower the microprocessor retainer and then lower the lever to secure the retainer. Ensure that the lever is securely locked into position.

What to do next:

- To work with another piece of hardware, go to the appropriate section.
- To complete the replacement, go to “Completing the parts replacement” on page 88.
- After a system board is replaced, do the following:
  1. Start the Setup Utility program by pressing the F1 key, and then check the BIOS version.
  2. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to download the latest version of firmware. Then, install the firmware to your server.
  3. Update the machine type, model number, and serial number of the system board. Either you will be prompted to do this while upgrading the BIOS, or you can locate the files for updating the VPD within the DOS BIOS package. For some servers, the VPD utility is available for download at: http://www.lenovo.com/drivers.

  Note: If you want to use the Firmware Updater program, ensure that it is the latest version. To get the latest version of the Firmware Updater program, go to http://www.lenovo.com/drivers, locate different versions of the program, and then identify the latest version by comparing readme files. If the latest version of the Firmware Updater program does not contain the latest version of the driver you need, download that driver separately from the Web page and install it individually to your server.

Completing the parts replacement

After completing the installation or replacement for all parts, you need to reinstall the server cover and reconnect cables.

To reinstall the server cover and reconnect cables to your server, do the following:

1. Make sure that all components have been reassembled correctly and that no tools or loose screws are left inside your server. See “Internal components” on page 17 for the locations of various components in your server.
2. If you have removed the front bezel, reinstall it. See “Removing and reinstalling the front bezel” on page 40.
3. Make sure that the cables are routed correctly before reinstalling the server cover. Keep cables clear of the hinges and sides of the server chassis to avoid interference with reinstalling the server cover.

4. Position the server cover on the chassis so that the rail guides on the bottom of the server cover engage the rails on the chassis. Then, slide the cover to the front of the server until it snaps into position.

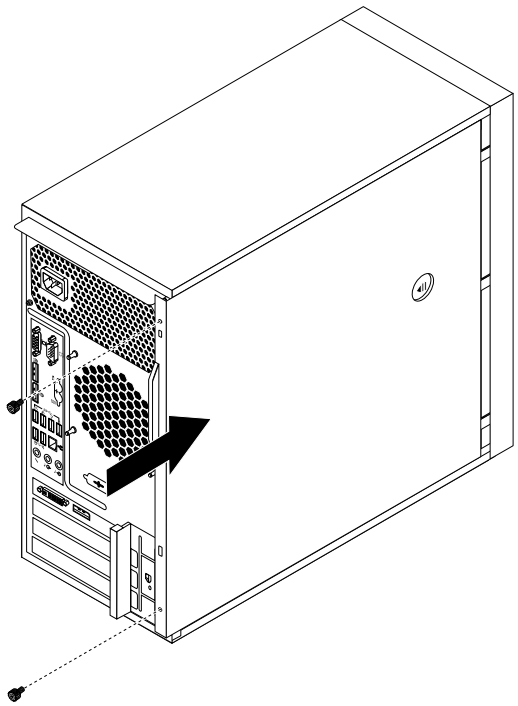


Figure 69. Reinstalling the server cover

5. Install the screws to secure the server cover.
6. Lock the server cover if you have a server cover lock. See “Integrated cable lock” on page 90 or “Padlock” on page 90.
7. Reconnect the external cables and power cords to the server. See “Front view of the server” on page 13 and “Rear view of the server” on page 14.
8. Depending on the parts you installed or replaced, you might need to confirm the updated information in the Setup Utility program. Refer to Chapter 5 “Configuring the server” on page 21.

Note: In most areas of the world, Lenovo requires the return of the defective Customer Replaceable Unit (CRU). Information about this will come with the CRU or will come a few days after the CRU arrives.

Connecting the cables

Attention: To prevent damage to equipment, connect the power cords after completing the parts replacement.

If the server cables and connector panel have color-coded connections, match the color of the cable end with the color of the connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on. See “Rear view of the server” on page 14 for an illustration of the I/O connectors on the rear of the server.

Connecting external devices

If you install a supported optional adapter, you can attach external devices to the server.

To attach an external device, do the following:

Note: If you are attaching an external device, see the documentation that comes with the device for information about cabling.

1. Read and understand the *Safety, Warranty, and Support Information* at http://www.lenovo.com/support, and “Guidelines” on page 37.
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the device to prepare it for installation and to connect it to the server.

Updating the server configuration

When you start the server for the first time after you install or remove an internal option or external device, you might receive a message saying that the configuration has changed. The Setup Utility program starts automatically so that you can save the new configuration settings.

Some options have device drivers that you must install. For information about installing device drivers, see the documentation that comes with each option.

You can obtain device drivers for operating systems that are not preinstalled at http://www.lenovo.com/support. Installation instructions are provided in readme files with the device driver files.

Installing security features

There are several security options available to help you prevent hardware theft and unauthorized access to your server. In addition to physical locks, you can also prevent unauthorized use of your server by a software lock that locks the keyboard until a correct password is typed in.

Note: Make sure that any security cables you installed do not interfere with other server cables.

Integrated cable lock

An integrated cable lock, sometimes referred to as the Kensington lock, can be used to secure your server to a desk, table, or other non-permanent fixture. The cable lock attaches to the integrated cable lock slot at the rear of your server and is operated with a key. The cable lock also locks the buttons used to remove the server cover. This is the same type of lock used with many notebook computers. You can order an integrated cable lock directly from Lenovo by searching for *Kensington* at:
http://www.lenovo.com/support

Padlock

Your server is equipped with a padlock loop so that the cover cannot be removed when a padlock is installed.

Password protection

To deter unauthorized use of your server, you can use the Setup Utility program to set a password. When you turn on your server, you are prompted to type the password. The server cannot be used until a valid password is typed in. Refer to Chapter 5 “Configuring the server” on page 21 for more information.

Chapter 7. Troubleshooting and diagnostics

This chapter provides information about basic troubleshooting and diagnostic methods to help you solve problems that might occur in the server. If your server problem is not described here, see “Help and service” on page 98 for additional troubleshooting resources.

Troubleshooting procedure

Use the following information as a general procedure for diagnosing and troubleshooting problems you experience with your server:

1. Verify that the power cords and the cables for all attached devices are connected correctly and securely.
2. Verify that the server and all attached devices that require ac power are connected to properly grounded, functioning electrical outlets.
3. Verify that all installed hardware and attached devices are enabled in the BIOS settings of your server. For more information about accessing and changing the BIOS settings, see “Using the Setup Utility program” on page 21.
4. If the server is not working after you have added new software, installed a new optional device, or replaced a piece of hardware, remove or reinstall the software or device to see if the problem could be solved.
5. Turn on the server and press Esc as soon as you see the logo screen to view any diagnostic messages.
6. Download and use a diagnostic program to diagnose problems. See “Using a diagnostic program” on page 91.
7. Refer to “Basic troubleshooting tables” on page 92 and follow the instructions for the type of problem you are experiencing. If the basic troubleshooting information does not help you resolve a problem, continue with the next step.
8. Try using a previously server configuration to see if a recent change to hardware or software settings has caused a problem. Before restoring your previous configuration, capture your current configuration in case the older configuration settings do not solve the problem or have adverse effect.
9. Use an antivirus program to see if your server has been infected by a virus. If the program detects a virus, remove the virus.
10. If none of these actions solve the problem, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 97.

Using a diagnostic program

The following diagnostic programs are available for you to diagnose server problems:

- ThinkServer Diagnostic Tool
- ThinkServer System Profile Collection Tool

To use a diagnostic program, do the following:

1. Go to http://www.lenovo.com/drivers and follow the instructions on the Web page to locate a diagnostic program.
2. Download and unzip the diagnostic program package to get the diagnostic program package folder.
3. Open the diagnostic program package folder and run the QTW.exe file.
4. Select the language when prompted. Then, click **Continue**.
5. Read the End User License Agreement (EULA) terms carefully and click **Accept** to start the program.

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6. Follow the instructions on the screen to use the diagnostic program.

For detailed information about using a diagnostic program, refer to the user guide of the diagnostic program, which is available for download at:
http://www.lenovo.com/drivers

Basic troubleshooting tables

Use the basic troubleshooting information to find solutions to problems that have definite symptoms.

ThinkServer EasyStartup program problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 91 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 97.

Note: If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in “Installing, removing, or replacing hardware” on page 42.

Symptom	Action
The *ThinkServer EasyStartup* DVD does not start.	1. Make sure that the server supports the ThinkServer EasyStartup program and has a bootable DVD drive. 2. Make sure that you have set the optical drive with the *ThinkServer EasyStartup* DVD as the first startup device. 3. Verify if the optical drive or the disc has problems. See “Optical drive problems” on page 92.
The operating system installation program continuously loops.	Make more space available on the hard disk drive.
The ThinkServer EasyStartup program cannot start the operating system media.	1. Make sure that the operating system media is supported by the ThinkServer EasyStartup program version your are using. For a list of the supported operating systems, refer to the user guide and compatibility notes for the ThinkServer EasyStartup program through the program main interface. See “Starting the ThinkServer EasyStartup program” on page 30. 2. Verify if the optical drive or the disc has problems. See “Optical drive problems” on page 92.

Optical drive problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 91 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 97.

Notes:

1. If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in “Installing, removing, or replacing hardware” on page 42.

2. If an action step is preceded by "(Trained service technician only)," this action step is reserved for a trained service technician and must be performed only by a trained service technician.

Symptom	Action
The optical drive is not recognized.	1. Make sure that: • The signal cable and connector are not damaged and the connector pins are not bent. • The optical drive is securely connected to the correct SATA connector on the system board and the SATA connector is enabled in the Setup Utility program. See "Using the Setup Utility program" on page 21. • All cables and jumpers (if any) are installed correctly. • The correct device driver is installed for the optical drive. 2. Run any optical drive diagnostic programs if you have. 3. Reinstall the optical drive and reconnect cables. 4. Replace the signal cable for the optical drive. 5. Replace the optical drive. 6. (Trained service technician only) Replace the system board.
A disc is not working correctly.	1. Make sure that the disc is in the optical drive with the shiny side facing down. 2. Make sure that the disc surface is clean and not scratched. 3. Check the disc or package for regional coding. You might need to purchase a disc with coding for the region where you are using the product. 4. Restart the disc player program. 5. Restart the server. 6. Run any optical drive diagnostic programs if you have. 7. Reinstall the optical drive and reconnect cables. 8. Replace the signal cable for the optical drive. 9. Replace the optical drive.

Hard disk drive problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see "Troubleshooting procedure" on page 91 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 "Getting information, help, and service" on page 97.

Note: If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in "Installing, removing, or replacing hardware" on page 42.

Symptom	Action
A newly installed non-hot-swap hard disk drive is not recognized.	1. Make sure that: • The signal cable and connector are not damaged. • The non-hot-swap hard disk drive is securely connected to the correct SATA connector on the system board and the SATA connector is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 21. • All cables and jumpers (if any) are installed correctly. 2. If you have any diagnostic programs, run the diagnostic programs to test the hard disk drive. 3. Reinstall the non-hot-swap hard disk drive and reconnect cables. 4. Replace the signal cable for the non-hot-swap hard disk drive. 5. Replace the non-hot-swap hard disk drive.
Multiple hard disk drives fail.	1. If you have any diagnostic programs, run the diagnostic programs to test the hard disk drives. 2. Make sure that the cable connection is correct. 3. Reconnect the power cable. 4. Reconnect the signal cable. 5. Replace the affected signal cable.

Memory module problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 91 for the subsequent steps you should check after using the information in this topic. If the problem cannot be solved by yourself, seek technical assistance. See Chapter 8 “Getting information, help, and service” on page 97.

Notes:

1. If you are instructed to remove, install, or replace any CRUs, refer to the related procedure in “Installing, removing, or replacing hardware” on page 42.
2. If an action step is preceded by “(Trained service technician only),” this action step is reserved for a trained service technician and must be performed only by a trained service technician.

Symptom	Action
The amount of system memory that is displayed is less than the total capacity of the installed physical memory modules and you suspect a memory module problem.	1. Make sure that: • All memory modules are the correct type supported by the server. See “Features” on page 7. • You follow the memory module installation rules. See “Memory module installation rules” on page 43. • All memory modules are seated correctly and securely. • The system firmware is up-to-date.

Symptom	Action
	2. If you have any diagnostic programs, run the diagnostic programs to test the memory modules. 3. Reinstall the memory modules. 4. Replace the suspect memory modules. 5. (Trained service technician only) Replace the system board.

Keyboard, mouse, or USB device problems

Follow the suggested actions for the corresponding symptom in the order in which they are listed until the problem is solved. If none of these actions solve the problem, see “Troubleshooting procedure” on page 91 for the subsequent steps you should check after using the information in this topic.

Symptom	Action
All or some keys on the keyboard do not work.	1. Make sure that: • The USB keyboard cable is securely connected to a USB connector on the server. If the USB keyboard is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server. • No keys are stuck. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 21. 2. Restart the server. 3. Replace the keyboard.
The mouse or pointing device does not work.	1. Make sure that: • The mouse or pointing device cable is securely connected to the server. If the USB mouse or pointing device is connected to a USB hub, disconnect the mouse or pointing device from the hub and connect it directly to the server. • The mouse or pointing device is clean and no dust accumulates. • The device drivers are installed correctly. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 21. 2. Restart the server. 3. Replace the mouse or pointing device.
A USB device does not work.	1. Make sure that: • The USB cable is securely connected to the server. If the USB device is connected to a USB hub, disconnect the device from the hub and connect it directly to the server. • The device drivers are installed correctly. • The USB controller is enabled in the Setup Utility program. See “Using the Setup Utility program” on page 21.

Symptom	Action
	2. Restart the server. 3. Replace the USB device.

Chapter 8. Getting information, help, and service

This chapter contains information about help, service, and technical assistance for products manufactured by Lenovo and where to go for additional information about Lenovo and Lenovo products.

Information resources

You can use the information in this topic to access useful resources relating to your needs when using the product.

Using the documentation

Information about your Lenovo system and installed software, if any, or optional devices is available in the documentation that comes with the product. The documentation can include printed documents, online documents, readme files, and help files. Most of the documentation for your server is on the documentation DVD provided with your server. Refer to the troubleshooting information in your server *User Guide* for instructions on how to diagnose problems and do basic troubleshooting. The troubleshooting and diagnostics information might tell you that you need additional or updated device drivers or other software. Lenovo maintains pages on the World Wide Web where you can get the latest technical information and download documentation or device drivers and updates. To access the Lenovo Support Web site, go to: http://www.lenovo.com/support

For more information about your server documentation, see “Server documentation” on page 2.

If you suspect a software problem, refer to the documentation, including readme files and online help, that comes with the operating system or software program.

ThinkServer Web site

The ThinkServer Web site provides up-to-date information and services to help you buy, use, upgrade, and maintain your server. You also can do the following by visiting the ThinkServer Web site at: http://www.lenovo.com/thinkserver

- Shop for servers as well as upgrades and accessories for your server.
- Purchase additional services and software.
- Purchase upgrades and extended hardware repair services.
- Access the Lenovo Limited Warranty (LLW).
- Access the online manuals for your products.
- Access troubleshooting and support information for your server model and other supported products.
- Download the latest device drivers and software updates for your server model.
- Find the service and support phone numbers for your country or region.
- Find a Service Provider located near you.

Lenovo Support Web site

Technical support information is available on the Lenovo Support Web site at: http://www.lenovo.com/support

This Web site is updated with the latest support information such as the following:

- Drivers and software

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- Diagnostic solutions
- Product and service warranty
- Product and parts details
- User guides and manuals
- Knowledge base and frequently asked questions

Help and service

This topic contains information about obtaining help and service.

Before you call

Before you call, do the following to try to solve the problem by yourself:

- Check all cables to ensure that they are connected.
- Check the power switches to ensure that the system and optional devices are turned on.
- Use the troubleshooting information in your system documentation on the documentation DVD that comes with your product.
- Check for the updated information, new device drivers, and hints and tips on the Lenovo Support Web site at:
  http://www.lenovo.com/support
- Download the diagnostic program from the Lenovo Web site, and then run it. See “Using a diagnostic program” on page 91.

If possible, be at your product when you call. Have the following information available:

- Machine type and model
- Serial numbers of your Lenovo hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Calling for service

During the warranty period, you can get help and information by telephone through the Customer Support Center.

The following services are available during the warranty period:

- **Problem determination** - Trained service personnel are available to assist you with determining a hardware problem and deciding what action is necessary to fix the problem.
- **Hardware repair** - If the problem is caused by hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - There might be changes that are required after a product has been sold. Lenovo or your reseller will make selected Engineering Changes (ECs) that apply to your hardware available.

The warranty does not cover the following:
- Replacement or use of parts not manufactured for or by Lenovo or non-warranted Lenovo parts
- Identification of software problem sources
- Configuration of the Unified Extensible Firmware Interface (UEFI) BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

For the warranty type and duration for your product, refer to the *Warranty and Support Information* on the documentation DVD that comes with you server. You must retain your proof of purchase to obtain warranty service.

For warranty service, consult the worldwide Lenovo Support telephone list. Telephone numbers are subject to change without notice. The most up-to-date telephone list for Lenovo Support is always available on the Web site at http://www.lenovo.com/support/phone. If the telephone number for your country or region is not listed, contact your Lenovo reseller or Lenovo marketing representative.

Using other services

If you travel with a Lenovo notebook computer or relocate your computer to a country where your desktop, notebook, or server machine type is sold, your computer might be eligible for International Warranty Service, which automatically entitles you to obtain warranty service throughout the warranty period. Service will be performed by service providers authorized to perform warranty service.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your computer is eligible for International Warranty Service and to view a list of the countries where service is available, go to http://www.lenovo.com/support, click **Warranty**, and follow the instructions on the screen.

For technical assistance with the installation of or questions related to Service Packs for your installed Windows product, refer to the Microsoft Product Support Services Web site at http://support.microsoft.com/directory or you can contact the Customer Support Center. Some fees might apply.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for hardware, operating systems, and application programs; network setup and configuration services; upgraded or extended hardware repair services; and custom installation services. Service availability and service names might vary by country or region. For more information about these services, go to the Lenovo Web site at: http://www.lenovo.com

Appendix A. Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service.

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Attention: Lenovo Director of Licensing

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Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk.

Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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Internet Explorer, Microsoft, Windows, and Windows Server are trademarks of the Microsoft group of companies.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1 024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from Lenovo.

Maximum memory might require replacement of the standard memory with an optional memory module.

Lenovo makes no representations or warranties with respect to non-Lenovo products. Support (if any) for the non-Lenovo products is provided by the third party, not Lenovo.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If Lenovo determines that the levels of particulates

or gases in your environment have caused damage to the server, Lenovo may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 2. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days
[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. [2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction. [3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.	

Polyvinyl Chloride (PVC) cable and cord notice

WARNING: Handling the cord on this product or cords associated with accessories sold with this product will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling***.

Recycling information

Lenovo encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. Lenovo offers a variety of programs and services to assist equipment owners in recycling their IT products. For information on recycling Lenovo products, go to:
http://www.lenovo.com/recycling

Recycling and disposal information for Japan is available at:
http://www.lenovo.com/recycling/japan

Battery return program

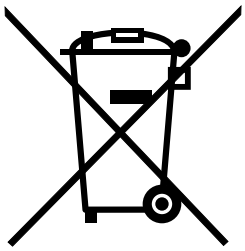
This product may contain a lithium or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal or batteries outside the United States, go to http://www.lenovo.com/recycling or contact your local waste disposal facility.

Battery recycling information for the United States and Canada

US & Canada Only

Battery recycling information for the European Union

EU



Notice: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury, and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, go to:
http://www.lenovo.com/lenovo/environment

Battery recycling information for Taiwan

廢電池請回收

Requirements for Batteries Containing Perchlorate

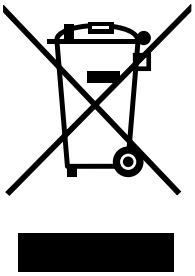
The following statement applies to users in the state of California, U.S.A.

California Perchlorate Information:

Products containing CR (manganese dioxide) lithium coin cell batteries may contain perchlorate.

Perchlorate Material - special handling may apply, See
http://www.dtsc.ca.gov/hazardouswaste/perchlorate

Important WEEE information



The WEEE marking on Lenovo products applies to countries with WEEE and e-waste regulations (for example, European Directive 2002/96/EC, India E-Waste Management & Handling Rules, 2011). Appliances are labeled in accordance with local regulations concerning waste electrical and electronic equipment (WEEE). These regulations determine the framework for the return and recycling of used appliances as applicable within each geography. This label is applied to various products to indicate that the product is not to be thrown away, but rather put in the established collection systems for reclaiming these end of life products.

Users of electrical and electronic equipment (EEE) with the WEEE marking must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to them for the return, recycle, and recovery of WEEE and to minimize any potential effects of EEE on the environment and human health due to the presence of hazardous substances. For additional WEEE information go to: http://www.lenovo.com/recycling

Restriction of Hazardous Substances Directive (RoHS)

This topic provides statements about the Restriction of Hazardous Substances Directive (RoHS).

China RoHS

有毒有害物质或元素名称及含量标识

Toxic / Hazardous Substances and Elements Table

部件名称 (Parts)	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
机架 chassis	O	O	O	O	O	O
外部盖板 external covers	O	O	O	O	O	O
机械组合件 mechanical assemblies	O	O	O	O	O	O
空气传动设备 air moving devices	X	O	O	O	O	O
冷却组合件 cooling assembly	X	O	O	O	O	O
内存模块 memory modules	X	O	O	O	O	O
处理器模块 processor modules	X	O	O	O	O	O
键盘 keyboard	X	O	O	O	O	O
调制解调器 modem	X	O	O	O	O	O
监视器 monitor	X	X	O	O	O	O
鼠标 mouse	X	O	O	O	O	O
电缆组合件 cable assemblies	X	O	O	O	O	O
电源 power supply	X	O	O	O	O	O
存储设备 storage device	X	O	O	O	O	O
电池匣组合件 battery pack assembly	X	O	O	O	O	O
电池 batteries	X	O	O	O	O	O
有 mech 的电路卡 circuit cards with mechs	X	O	O	O	O	O
无 mech 的电路卡 circuit cards w/o mechs	X	O	O	O	O	O
激光器 laser	X	O	O	O	O	O

O：指示部件的所有均质材料中有毒和危险物质的含量均低于 SJ/T 11363-2006 中所描述的浓度限制要求。
O: indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006.

X：指示至少有一种部件均质材料中的有毒和危险物质的含量超过 SJ/T 11363-2006 中所描述的浓度限制要求。
X: indicates that the content of the toxic and hazardous substance in at least one homogeneous material of the part exceeds the concentration limit requirement as described in SJ/T 11363-2006.

环保使用期限（EPUP）的免责条款：EPUP 规定的具体期限仅为符合中华人民共和国的相应的法律规定，并非代表 Lenovo 向客户提供保证或负有任何义务。EPUP 中假定客户按照操作手册在正常情况下使用本产品。对于本产品中配备的某些组合件（例如，装有电池的组合件）的 EPUP，其效力可能低于本产品的 EPUP。

Environmental Protection Use Period (EPUP) Disclaimer: The number provided as the EPUP is provided solely to comply with applicable laws of the People's Republic of China. It does not create any warranties or liabilities on behalf of Lenovo to customer. The EPUP assumes that the product will be used under normal conditions in accordance with the Lenovo operating manual. Certain assemblies inside this product (for example, assemblies that contain a battery) may have an EPUP which is lower than the EPUP on this product.

Turkish RoHS

The Lenovo product meets the requirements of the Republic of Turkey Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (EEE).

Тьrkiye EEE Yцnetmelipine Uygunluk Beyanэ

Bu Lenovo ьrьnь, T.C. 3evre ve Orman Bakanlэpэ'nэn “Elektrik ve Elektronik Eюyalarda Bazэ Zararlэ Maddelerin Kullanэmэnэn Sэnэrlandэrэlmasэna Dair Yцnetmelik (EEE)” direktiflerine uygundur.

EEE Yцnetmelipine Uygundur.

India RoHS

RoHS compliant as per E-Waste (Management & Handling) Rules, 2011.

European Union RoHS

Lenovo products sold in the European Union, on or after 3 January 2013 meet the requirements of Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (“RoHS recast” or “RoHS 2”).

For more information about Lenovo progress on RoHS, go to:
http://www.lenovo.com/social_responsibility/us/en/RoHS_Communication.pdf

German Ordinance for Work gloss statement

The product is not suitable for use with visual display work place devices according to clause 2 of the German Ordinance for Work with Visual Display Units.

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

Export classification notice

This product is subject to the United States Export Administration Regulations (EAR) and has an Export Classification Control Number (ECCN) of 4A994.b. It can be re-exported except to any of the embargoed countries in the EAR E1 country list.

Electronic emission notices

The following information refers to the Lenovo ThinkServer machine types 70A0, 70A1, 70A4, and 70A5.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Lenovo is not responsible for any radio or television interference caused by using other than specified or recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union - Compliance to the Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Lenovo cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the installation of option cards from other manufacturers.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Lenovo, Einsteinova 21, 851 01 Bratislava, Slovakia

CE

Warning: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

German Class A compliance statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit
Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der Lenovo empfohlene Kabel angeschlossen werden. Lenovo übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der Lenovo verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der Lenovo gesteckt/eingebaut werden.

Deutschland:

Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Betriebsmittein
Dieses Produkt entspricht dem „Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln“ EMVG (früher „Gesetz über die elektromagnetische Verträglichkeit von Geräten“). Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG (früher 89/336/EWG) in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Betriebsmitteln, EMVG vom 20. Juli 2007 (früher Gesetz über die elektromagnetische Verträglichkeit von Geräten), bzw. der EMV EG Richtlinie 2004/108/EC (früher 89/336/EWG), für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraf 5 des EMVG ist die Lenovo (Deutschland) GmbH, Gropiusplatz 10, D-70563 Stuttgart.

Informationen in Hinsicht EMVG Paragraf 4 Abs. (1) 4:
Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Nach der EN 55022: „Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.“

Nach dem EMVG: „Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.“ (Auszug aus dem EMVG, Paragraph 3, Abs. 4). Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt 14/93) kostenpflichtig.

Anmerkung: Um die Einhaltung des EMVG sicherzustellen sind die Geräte, wie in den Handbüchern angegeben, zu installieren und zu betreiben.

Korea Class A compliance statement

A급 기기 (업무용 방송통신기자재)
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Japan VCCI Class A compliance statement

この装置は, クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI－A

Japan compliance statement for products which connect to the power mains with rated current less than or equal to 20 A per phase

日本の定格電流が 20A/相 以下の機器に対する高調波電流規制
高調波電流規格 JIS C 61000-3-2 適合品

Lenovo product service information for Taiwan

台灣 Lenovo 產品服務資訊如下:
荷蘭商聯想股份有限公司台灣分公司
台北市內湖區堤頂大道二段89號5樓
服務電話： 0800-000-702

Eurasian compliance mark

Brazil regulatory notice

Ouvir sons com mais de 85 decibéis por longos períodos pode provocar danos ao sistema auditivo.

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